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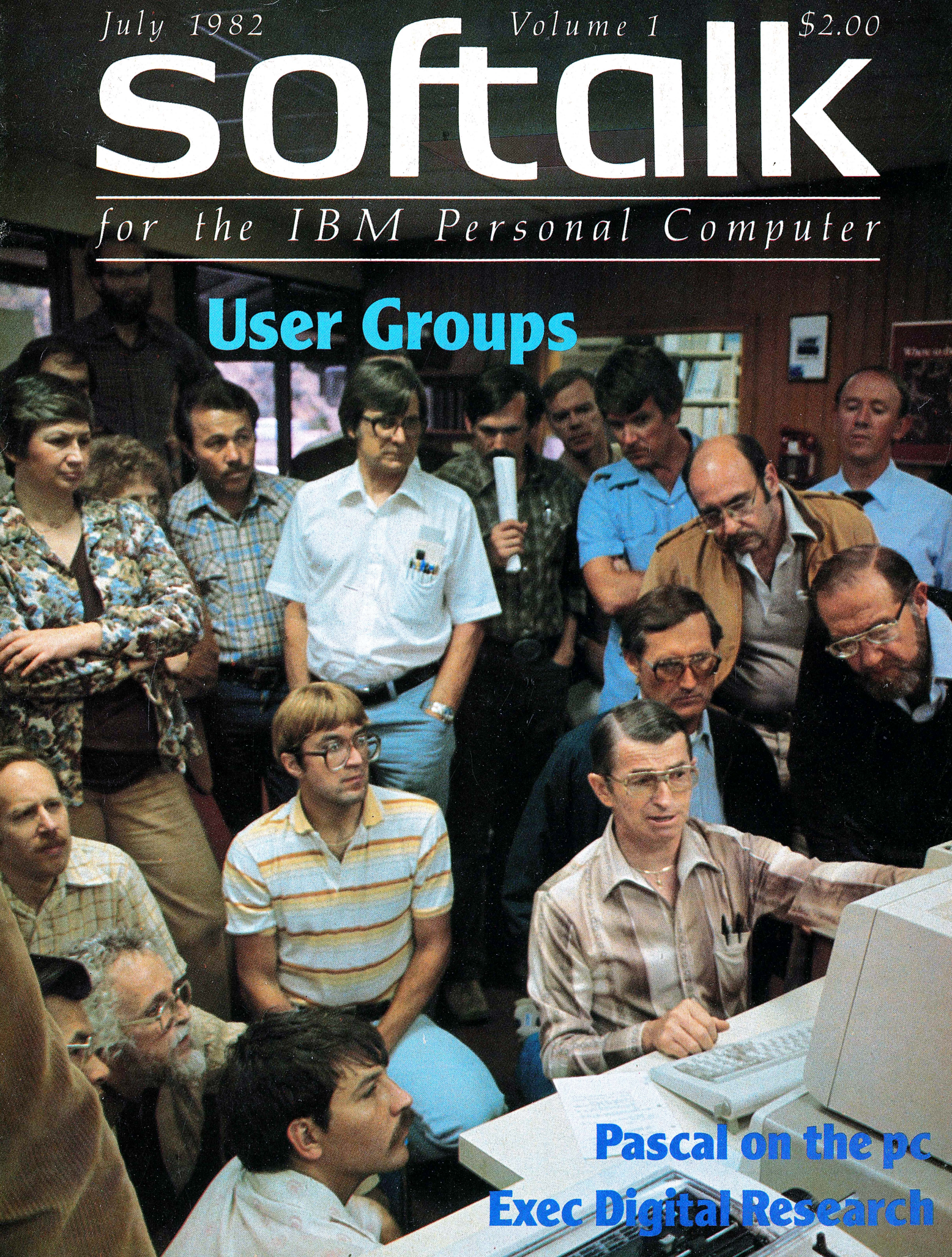
for the IBM Personal Computer



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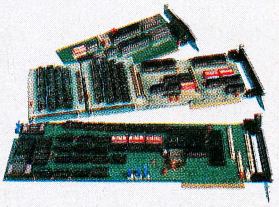

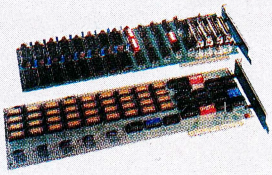

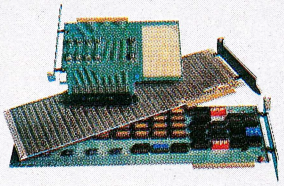

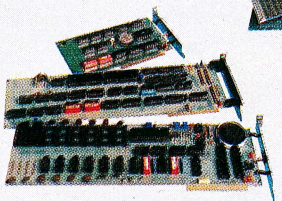

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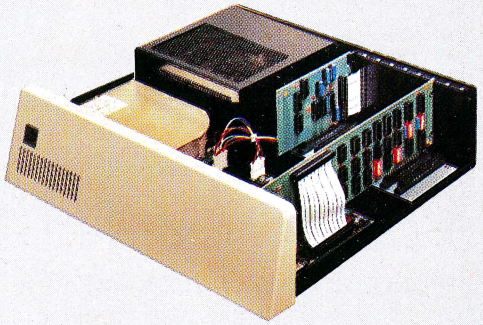

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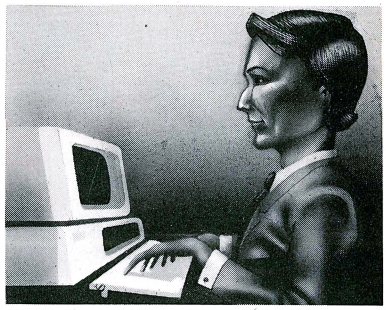

cross talk

Crosstalk is your opportunity to communicate with your fellow reader as well as with the editors and authors of Softalk for the IBM Personal Computer. *If you have a word to spread, a case to plead, a solution to seek—or just a comment to make—this space is for you. This month we'd like to share some responses we've received to our premiere issue.*

Friends on a New Path
I am a new subscriber to *Softalk IBM* and am happy to tell you how useful and attractive your publication is. I am new to the world of computers, so the magazine is right on target for me.

Kathleen H. Blank, Costa Mesa, CA

Solid Software
I just picked up the new June issue and liked what you have to offer in this version for the IBM pc. So far I have bought several programs—*Volkswriter*, which I think is excellent for my usage, *Home Accountant Plus*, and *Typing Tutor*, to bring my speed up. I like your magazine; keep it up. This is a hobby to me and I am still learning Basic. I like the tutorial information and hope that you keep it coming.

Les Matson, Torrance, CA

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After paying for my new IBM pc, your price sounds just right.

Glenn R. Fillmore, Jr., Alexandria, VA

I was delighted to see your magazine on the rack and even more delighted to see your free subscription offer.

Clarence H. Baisdon, Torrance, CA

Today I purchased a copy (the premiere issue) of *Softalk IBM*. I was so impressed with its content that I immediately looked in the front for the subscription rate. You can imagine my unbelieving surprise—in this day and age when "you can't get nothin' for nothin'."

Marvin W. Horner, Pasadena, CA

From Fruit to Nuts and Bolts
As a current recipient of the Apple *Softalk* magazine, I certainly look forward to your new publication. I will be most interested in programming topics, especially using the IBM Pascal compiler. You may be interested that this letter was formatted using a "Script" formatter I have written in Pascal. Graphics and communications are my other primary interests, if you are taking requests.

C. M. (Mike) Hammock, Marietta, CA

I have been a reader of *Softalk* for the Apple since the beginning. Now that I have an IBM pc I am pleased that you now have a version for this machine.

Stephen L. Billard,
Huntington Beach, CA

Added Attraction
I particularly enjoyed the advertising in the first issue of your magazine since I have seen very little for the pc in other magazines I subscribe to.

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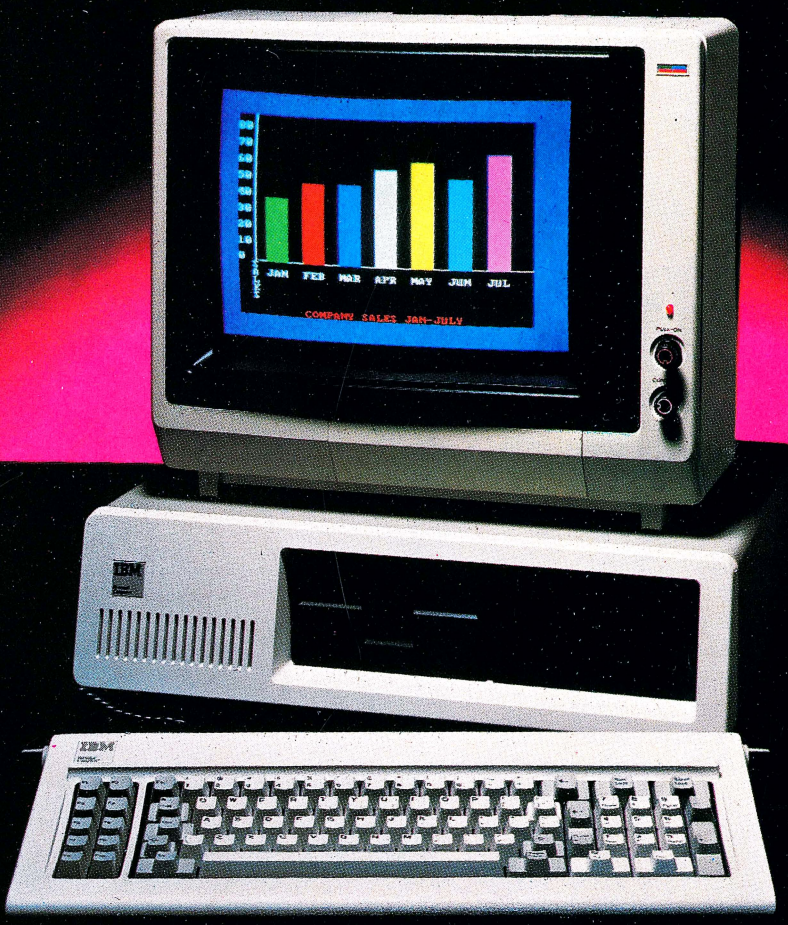

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Exec

Digital Research: Systems Pioneers

Gary Kildall, author of microcomputerdom's best-selling operating system.

by Allan Tommervik

The world of systems software is as different from applications software as the personal computer is different from the abacus. Systems software development is traditionally performed by the manufacturer of the system, because only the manufacturer is privy to the unique architecture of the new machine. Such knowledge is vital because it's primarily architecture that distinguishes one desktop computer from another.

That's particularly true when manufacturers adopt the same microprocessor as the heart of their various creations. Exploiting different capabilities provided by dissimilar architecture is then a must if the manufacturer is to successfully stake out a segment of the marketplace.

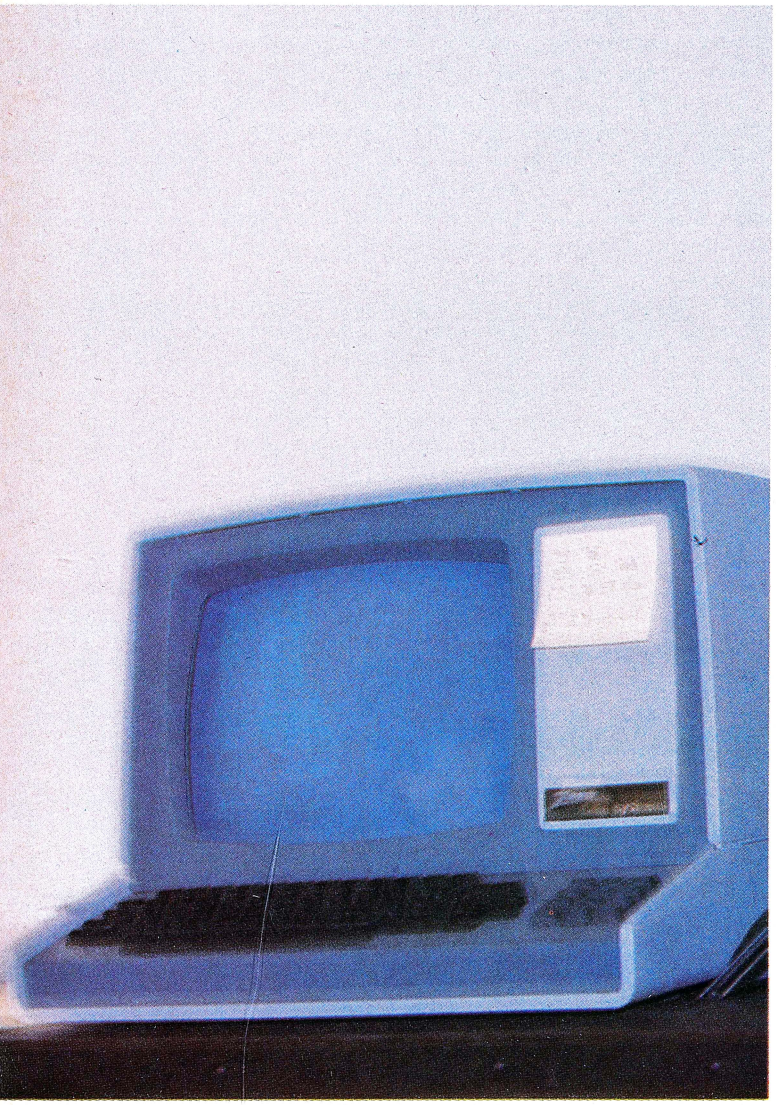
Commodore, Apple, and Atari each have proprietary operating systems that emphasize the features of their unique implementations of the 6502 microprocessor. Likewise, Tandy developed a proprietary operating system around the Z-80 chip. It's clear that personal computer manufacturers feel that proprietary is best.

The CP/M Bandwagon. The desktop computer market has not been afflicted with the same provincial attitude. Although most of these manufacturers have supplied proprietary operating systems, their advertising trumpets their versatility with essentially the same claim: "CP/M compatible."

CP/M has been sine qua non for the top of the microcomputer market since day one, and its adaptation to the pc just continues the trend that no machine can be a viable marketplace competitor without providing CP/M capability. Two widely heralded flops in the microcomputer market—Texas Instruments's TI 99/4A and Nippon Electric Company's PC-8000—both ignored the CP/M imperative. In fairness, it should be reported that no CP/M alternative was available for TI's sixteen-bit microprocessor and that NEC kept promising a CP/M adaptation. But the facts speak for themselves: Microcomputer manufacturers fail to harness the CP/M alternative with its huge library of applications software at their own risk.

Despite being hobbled by an eight-bit bus, the pc ushered in the era of sixteen-bit microcomputers for personal and desktop use. And Microsoft and Digital Research responded to that introduction with competitive software, representing the next era of operating systems. The systems have at least one common link—both borrow heavily from the original CP/M.

Kildall & Company. The genius that is CP/M is the ability to transcend the differences in architecture between systems while simultaneously acknowledging those differences, thus providing a



standard operating environment for software manufacturers while obviating the necessity for proprietary operating systems to get maximum performance.

The genius behind CP/M is Gary Kildall, developer of the product and president of Digital Research.

Kildall's success contradicts Shaw's maxim that "he who can does. He who cannot teaches." Kildall's initial effort on CP/M came during a period when his full-time occupation was that of professor of computer sciences at the Naval Postgraduate School in Monterey, California. On the side, he was acting as a consultant for Intel, and it was there that the need for a microcomputer-size operating system manifested itself.

Intel had Kildall working on the task of compiler optimization for the then-new language of PL/M, which is a stripped-down version of PL/1. During this same period, *circa 1972-1973*, Intel was intensively developing the first of the microprocessors—the 4004 and then the 8008. The results of that research effort formed the bedrock of today's microcomputer explosion.

The chips themselves were being applied to development systems that were the forerunners of desktop computers. Systems software development was occurring simultaneously on PDP-10 and IBM 360 series computers and being downloaded to the development systems. The requirement for low-cost input/output devices resulted in drafting the nearly ubiquitous paper-tape Teletype machines into service. And it was that addition that raised the necessity of developing some kind of operating system.

Kildall called his response to that need CP/M, for control program for microcomputers, and paralleling the name of the higher level language his systems software was supporting.

The period from late 1973 through 1974 was an exciting time for computer technologists everywhere. Intel had a hard-driving team developing the 8080. MITS was working on the Altair in Albuquerque. Shugart was experimenting with floppy disks as a storage medium. Imsai was preparing for the introduction of the first disk-based microcomputer.

Few people were as fortunately placed as Kildall. His location in Monterey kept him out of the mainstream madness. Being on the periphery of Silicon Gulch yet being inside Intel gave him both a wider perspective than could be obtained from being immersed in the industry and an insider's view of what was possible. And with a doctorate in computer science from the University of Washington under his belt, Kildall was clearly the right man in the right place at the right time.

He continued upgrading CP/M while at Intel, adding utilities such as an assembler and a debugger to make the system more useful to software developers. He also corralled one of the earliest Shugart drives to keep his software state-of-the-art. Around that early Shugart product, Kildall developed the bifurcated system that CP/Mers have grown to know and love.

The elements were BDOS and BIOS, standing respectively for basic disk operating system and basic input/output system. BDOS was designed to remain unchanged, regardless of what hardware was running under the operating system. This farsighted decision ensured that CP/M files would always be compatible and portable. BIOS was the part of the system that recognized the changed circumstances of various hardware configurations. It's the versatility built into the BIOS that makes CP/M possible on more than six hundred different computers.

The system went through two revisions while under the aegis of Intel, but eventually the company decided to concentrate its resources in other areas and Kildall was on his own. This was the period when the technical hobbyist was pushing the technology. In garages and computer clubs, they were making their own. These systems were disparate in architecture and peripherals, but all had a need for an operating system and Kildall's CP/M filled the bill.

The Birth of Digital Research. Hobbyist demand for the product forced Kildall and Dorothy McEwen to form Digital Research in 1975. Adoption of the system was neither immediate nor widespread; rather than being decreed from on high, it gathered momentum at the grassroots level. One hobbyist would tell another who would inform a friend who was a small manufacturer.

From its initial acceptance by small manufacturers, the product won the respect of larger and larger original equipment manufacturers until today machines made by IBM, Xerox, Digital Equipment, and Wang operate under CP/M.

The original commercial version of CP/M was 1.3. Version 1.4 was introduced in 1976, version 2.2 surfaced in 1979, and version 3.0 will appear this year. Even as Digital Research was keeping its operating system upgraded to match technological strides, Kildall began looking at ways to serve the independent software vendor. Thus was born the language development group.

The first project was to bring PL/1 to the microcomputer ISV community. Digital Research went for the mainframe language specifically because it was familiar to mainframe programmers who might migrate into the micro field and because it provided a flexible

John Rowley jumped ship from giant Intel to ride the wave of Digital Research's success.

environment for the development of high quality applications software. Digital opted for the ANSI standard general-purpose subset of PL/1 for migration to micros and introduced it late in 1979.

Kildall believes PL/1 is making headway against Pascal as the preferred language of ISVs seeking power and portability. PL/1-86, the sixteen-bit version of the language, is scheduled to enter beta testing soon.

Digital also offers CBasic, Pascal/MT+, and Cis Cobol to ISVs, but none is an in-house development. The acquisition of Compiler Systems gained Digital CBasic and the services of CBasic author Gordon Eubanks as head of language development. Pascal/MT+ is a product of MT Microsystems, another company now in the process of being acquired. Cis Cobol is the product of the British firm Micro Focus and is licensed by Digital.

More Operating Systems. If all that sounds like Digital Research has forsaken operating systems for languages, it makes the wrong impression. Kildall brought Tom Rolander on board to honcho systems software development, the latest product of which is CP/M-86 for the 8086-based and 8088-based computers.

To be released next month is the product that more than any other will establish the pc as a peer above peers in the personal and desktop computer market. It's Concurrent CP/M-86 and it allows a 256K pc to perform as many as four tasks at one time. A pc user will soon be able to send a document to his printer, draw relief maps on a plotter, run his electronic spreadsheet, and proceed with a letter to Aunt Martha—simultaneously.

Operating systems for networking have also been developed—MP/M II for eight-bit processors and MP/M-86 for sixteen-bit machines.

A totally separate group is working on advanced research and development projects. Under the direct supervision of Kildall, this group is working to make operating systems better for ISVs and friendlier for end users—a task that would test the wisdom of Solomon and the knowledge of Norbert Weiner. Kildall is the first to admit that CP/M is a nonfriendly operating system to end users. He adds Oasis, Unix, and PC-DOS to the category of unfriendly operating systems.

As a model, he looks to the Xerox Star and Smalltalk. To him, the successful operating system of the future will be easy enough for an eleven-year-old to use while providing transparent power for the ISVs. The configuration of that future system would be a basic operating system overlaid by a powerful graphics and data management module, transparent to the user but a powerful and friendly tool for the programmer. A user interface, devoid of abstractions, would top off the system.

Such an operating system, Kildall believes, will provide a powerful environment for applications software.

Exponential Growth. It does not belabor the facts to point out that all this development—past and future—is nontrivial. A year ago, Digital Research employed around forty persons. Six months ago the number was about eighty. Today, it's one hundred eighty-two, many of whom are working on a new body of products to support the 68000 microprocessor. That kind of growth clearly stretches any company's management.

What management? Well, there's lots of management now, but up yonder in passing there was a mention of Dorothy McEwen, the other founder and currently vice president of operations of Digital Research. It was McEwen who set the marketing and business structure of the company and guided it to the threshold of its present explosive growth while Kildall concentrated on the technical and product development side. That's not too shabby a track record for a former computer programmer and American Telephone and Telegraph sales rep who had to learn good management techniques on the fly while under the gun.

When it became apparent that more experienced management was needed, Kildall and McEwen took the unorthodox approach of contacting venture capitalists—not out of need of money but for help in recruiting key management additions. Of course, some money changed hands too, venture capitalists being particularly skilled at recognizing opportunity even before it raises its hand to knock.

It's a measure of Digital Research's standing that the venture capitalists attracted represent some real giants. TA Associates of Boston may soon be pushing First Boston as premier private placement mediator in New England. Venrock Associates of New York had early positions in Apple and VisiCorp. Hambrecht & Quist Group of San Francisco also had an Apple connection. Page Mills Partners of Los Altos, California, has been active in Silicon Gulch financial affairs.

Aggressively Serving. This group, spearheaded by Jacqueline Morby of TA, set out to run down the best management team possible for Digital. Among those approached for advice and search assistance was John Rowley, then chairman of Intel's strategic planning committee for OEM systems modules. Rowley's knowledgeable and helpful assistance in filling some slots caused Morby to approach him for a top management position. She persisted through several Rowley denials of interest until she got her man.

Rowley became chief operating officer of the company last December. That acronyms to COO, but Rowley is no pigeon for the plucking or dove avoiding a fight. He served his management apprenticeship with Tektronix, renowned in technology circles for its aggressive marketing and sales stances, and at Intel, where only the fit survive.

That doesn't mean that Rowley will be changing Digital Research's image of being a company that's concerned about its user base. His background indicates that his aggressiveness will take the form of enhancing that care and service.

Rowley and Kildall share a philosophy of providing service to the community they serve. Kildall's concept of service almost included underpricing the initial commercial price of CP/M to $50. It was McEwen who insisted on the introductory price of $70 as still being low enough to provide quality software inexpensively while leaving some margin for further development and profit.

Rowley grew up with the concept of service to the community. When he was in grade school, his family moved to Goldendale, Washington, where his father bought into an insurance agency. He observed the success of his father's principle that good business was

Continued on page 26

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newspeak

Cold War. In the small but profitable supercomputer market, Cray Research and Control Data are far and away the leaders. The two companies are based in Minneapolis, ten miles apart.

The similarities do not end here. Until 1976, Seymour Cray, founder and president of Cray Research, worked as a computer designer for Control Data. He left to start his own company, feeling that Control Data wasn't developing supercomputers fast enough.

Technically, a supercomputer functions at a speed of twenty million floating-point operations per second and is capable of handling a range of problems that have a database of more than a trillion words. Only forty-four supercomputers have been installed worldwide; thirty-nine are Cray Is and five are Control Data Cyber 205s.

Soon after Cray Research's inception, a rivalry developed between the two companies that continues to this day. Several times in the past five years, Control Data has accused Cray Research of practicing "one-upmanship."

Some of the bad feeling between the two companies originates from an incident that took place a few years ago in Manchester, England. After a meeting of Control Data's European customers, Cray grabbed the potential buyers as they were leaving and bused them to a different location for a look at Cray's supercomputer.

The *Wall Street Journal* (May 25, 1982) reported another Cray maneuver that brought howls of displeasure from Control Data. Control Data was set to unveil its new line of general-purpose computers when Cray took the limelight by announcing a faster version of its own supercomputer just one day before.

Although Cray did circulate a brief notice at Control Data's customers' meeting in Saint Paul, a spokesperson for the firm claims their announcement was planned for months and wasn't timed to embarrass the competition. The brief notice in question invited the Control Data customers over to Cray Research while they were in town.

Cray's unveiling was a big deal for the company, apart from any consternation it caused at Control Data. Customers and the press were taken to Chippewa Falls, Wisconsin, for a press conference in a factory. This was a first for Cray, and the media, including television, showed up in force.

"We think of ourselves as innovative and in the forefront of a new technology," says a Cray spokesperson. "We've been portrayed as concentrating on the competition, which is not really accurate and has caused a lot of grief."

The grief certainly hasn't affected Cray's share of the supercomputer market. With more than 80 percent of the supercomputer market, Cray is clearly ahead of Control Data, which earns most of its money from minis and mainframes. Control Data's total sales last year were in the billions of dollars; Cray racked up sales of about $100 million.

Cray is not the only guilty party in this corporate rivalry. According to the *Wall Street Journal*, Control Data started a short-lived rumor that Seymour Cray was leaving his company before the Cray II supercomputer's projected 1985 completion and shipping dates.

But Cray is not leaving, and the Cray II should reach a working prototype stage sometime in 1983. Until then, the Hatfields and the McCoys will probably find something else to bicker over, but the business of making computers goes on.

Knock on Any Door. A national survey recently conducted by Dunhill Personnel System sheds light on the data processing job market. The study, broken down into the eight top data processing fields by area, indicates that computer processing has weathered the recession better than any other job market, but the grass isn't as green as it used to be.

There was a time once when programmers, programmer analysts, systems programmers, and systems analysts were treated practically like movie stars. Salaries were sky-high, and if you didn't like a job there were dozens of others to choose from.

The Dunhill survey says that companies hiring data processing personnel have grown up. Hiring officials are wiser now because they know more about what they're looking for.

Results of the survey for specific markets show that oil and gas companies offer the biggest salaries. A systems programmer in these industries averages a little more than $35,000 a year. By contrast, a systems programmer in the banking industry makes a little less than $25,000. A systems analyst working in the oil and gas industries makes, on the average, $30,000 a year, while a systems analyst in the insurance business makes a little more than $25,000.

The low spot on the totem pole is reserved for the programmer. On the average, programmers make $28,000 a year in oil and gas; both insurance and banking programmers make slightly less than $20,000.

When the facts are broken down by state, California comes out the overall winner. Its lifestyle may be a little crazy, but the West Coast offers computer professionals the best money. On the average, California programmers earn close to $25,000 a year, compared to those in Massachusetts who're lucky if they get $18,000 annually.

Monetarily speaking, New York, Illinois, and Washington, D.C., are the best areas after California, although salaries vary from job to job. A systems programmer in the nation's capital makes a fair bundle, but the lowly programmer/analyst could do as well in Texas or Michigan.

Unreal People. They're called "replicants" in *Blade Runner*, but don't be fooled. The baddies out for Harrison Ford's tail in the movie are plainly and simply robots.

Ridley Scott's film is based on the late Philip K. Dick's classic science fiction novel, *Do Androids Dream of Electric Sheep?* Both the film and the book are speculation on what biological humanity may have created by the year 2024. In the here and now, nothing resembling Dick's superhuman replicant is anywhere near the design stage. For the moment, humanoid robots are even more of a pipe dream than fusion power.

"The humanoid robot is to robotics what the butterfly is to flying. It's an inspirational model," explains Carl Helmers, editor of *Robotics Age*. "Needless to say, when trying for a butterfly, you may end up with a Boeing 747."

The May/June 1982 issue of the New Hampshire-based journal for intelligent machine applications and development features an informative editorial by Helmers on the relationship of computers and robots.

He writes: "A robotic engineering design which does not take into account modern computer design and application is bound for failure. Everything in robotics is intimately bound up with the use of computers—both as tools of design and as structural elements of designs."

Later in the editorial, Helmers puts it differently: "The new field of robotics stands on the shoulders of previous advances in the computer field."

Robotics also stands on the shoulders of previous advances in mechanical and electrical engineering. But computer technology is what makes it all happen, supplying the intelligence to guide mechanical arms and

robotic sensors.

Computers are also integral to the design of intelligent machines. A "pyramid of abstractions" illustrates how computers are used in the development of robotic systems.

At the top of the pyramid are software programs where abstract designs are born. The abstract design is then linked with generalized hardware for testing and development in programmed simulations. It's still easy to change the abstraction at this level because the simulation is mostly in the computer.

Once specialized hardware is implemented, the process becomes less flexible, and changing the design could make expensive equipment obsolete.

At the base of the pyramid, the abstract design finally enters the real world of motion systems. "The fact that we will ultimately convert some parts of the abstraction pyramid to real hardware is what keeps us honest as designers—the ultimate test of our simulation is whether or not it works in real life," Helmers writes.

Helmers compares operating systems, typical software environments, as tools of robotic development projects. The best system, he says, appears to be Lisp on special hardware at a cost of approximately $50,000, with fifty megabytes of hard disk storage and 250K of main memory. Unix on a minicomputer runs around $75,000 including ten megabytes of mass storage and 250K of main memory. The UCSD p-System rates just behind CP/M; both are relatively cheap and require no software engineering.

Helmers believes that soon large arrays of bubbles and semiconductors will replace disks. This will benefit robotics and computer science, but, as with other technological advances, there will be casualties. Helmers cites a local New Hampshire center for producing precision ball bearings that faces the prospect of losing a large market. The company makes bearings for the spindles found in many floppy and hard disk drives. Disk manufacturers will obviously be in for rough times too.

The experimental robotics version of the old Altair computer kits will appear sometime in the next nine months, Helmers predicts. This should help people learn about robotics on their own, just as the build-'em-yourself computers opened up the world of amateur computing six years ago.

Robots linked with personal computers are valuable training tools. An Apple or an IBM pc equipped with a relatively inexpensive robot arm is much more accessible to inexperienced operators than the big computer systems actually used to run most modern robots.

So where are the androids? Ask your local science fiction nut; that's the only place you'll find them today—in science fiction.

The majority of real-life robots are still in factories, welding and spray painting, not quite drinking beer yet or rooting for the surprising Detroit Tigers. Some robots are swimming around drilling platforms like fish, and some are flying at incredible speeds toward the edge of the solar system.

But no robots have stood up on their own two feet and taken the first step on the long road to becoming humanoid.

Surviving the Revolution. If you've ever been up late at night and had your computer hit a bump in the road and lose your last hour's worth of writing, you've known technological frustration. Computers are just not that foolproof yet. Even personal computers are really impersonal; they have total disregard for the human being.

A computer doesn't know who you are and doesn't give a hoot about what you're up to. It'll accidentally erase data in memory whether you're the chief executive of the country or a stringer for the *Hawthorne Herald*. Humans are at fault, we know that. After all, we built the darned machines.

The problem is that most people in the early stages of the computer revolution are unfamiliar with and just a little bit scared of computers. With the revolution just now hitting stride, the psychological effects of computers are becoming the subject of increased investigation.

Thomas McDonald is a psychologist with Transition Associates in San Diego, California. He's very interested in the stresses and strains created by computers in the workplace and the home. But he's quick to point out that most people seeking psychiatric help suffer from any of a million problems.

"Very rarely, if ever, will someone come in and say, 'I'm stressed because of my computer.' But in the last three years we've seen ten or twelve people in trouble, marital or work related, where computers were a complication.

"Computers can generate a unique set of stresses and strains. If these remain unaddressed, they can create problems."

According to McDonald, few people suffering from computer-related stress get anywhere near therapy or a psychologist's office; it's "the tail of an elephant." McDonald has talked to operations managers in local companies, which is where you can see all the levels of computer-related stress and strain.

McDonald believes that some of the blame rests with vendors who need to offer more help with the process of introducing computers into the work environment. By some estimates, more than half of the country's businesses will use computers by 1990. Walking into a situation with no computer experience can be very scary.

"You don't have to worry about kids so much, because they'll be exposed to computers like mother's milk. But the great swath of middle America is going to find them a whole new thing," McDonald says. "The workplace has to be computerized and humanized."

Computers are machines, and humans are not made of the same stuff. We don't think logically all the time and we're capable of burning out if a situation becomes too stressful. The computer won't burn out (most of the time).

McDonald defines a revolution as something that happens in a very short time, can't be predicted, and has a wide effect. Any kind of revolution—social, political, or technological—causes transitional stress. Great technical advances create pressures of adaptation and cultural shock.

Computers will be as pronounced an influence in our lives as television and cars, which have stress-causing effects themselves, but they're much easier to use. Many improvements will be needed to make computers more friendly and foolproof.

McDonald plans to help keep investigating the problems of computer stress and formulating ways to combat it. We should all be thankful that someone is bothering to look after our heads. ▲

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THE PROFIT PLOT

by Shirley Fisher

Two of the most important types of financial statements for a small business are the *balance sheet* and the *profit-and-loss statement*. The difference between the two can be illustrated by comparing the balance sheet to a photograph and the profit-and-loss statement to a motion picture.

In other words, the balance sheet presents a financial picture of your business—its assets, liabilities, and ownership—on a specific date. The profit-and-loss statement, sometimes also called the income statement, measures your costs and expenses against sales revenues over a specific period of time—such as a month, quarter, or year—to show the net profit or loss of your business for that entire period. A balance sheet will have a specific date, such as July 31, 1982, while a profit-and-loss statement will indicate the period covered—for example, "For the Year Ended June 30, 1982."

We'll use *VisiCalc* to create these two financial statements for a hypothetical company.

Contrasting Equals. The balance sheet has two main parts. The first shows *assets*. The second shows *liabilities* (or debts) and the owners' equity. Liabilities and equity, taken together, represent all claims against the assets. The total assets will always equal the combined total of liabilities and owners' equity (or capital); hence the name balance sheet.

The two parts of the balance sheet are usually displayed one below the other on the page, but you may sometimes see assets and liabilities displayed side by side, with assets to the left.

Anything your business owns, if it has monetary value, is an asset. Common assets of a small business include such items as cash, notes receivable, accounts receivable, inventory, land, buildings, equipment, machinery, and other investments. These assets can be broken down into three categories: current, fixed, and other.

Current assets include cash and any assets that are expected to be converted to cash during the normal operating cycle of your business—usually within a year. This category might include such things as notes receivable, accounts receivable, inventories, and marketable securities. The key point is time; if the item cannot be expected to be converted to cash within a year, then it's usually treated as a fixed, rather than a current, asset.

Fixed assets are those things designed for long-term use in your business. Examples are land, buildings, machinery, equipment, furniture, and fixtures. These assets are typically not for resale. They are items necessary for conducting business and are recorded on the balance sheet at cost, less depreciation. Because a fixed asset is a long-term expense, with the cost allocated over the working life of the asset, the value shown on the balance sheet is not necessarily the same as its possible resale worth.

The Untouchables. *Other assets* is a somewhat elusive category, one that's more difficult to measure. It includes such things as patents, trade investments, and good will. Other assets are typically intangible—things that can't be physically touched.

Liabilities are claims creditors make against your assets. They do not include claims by owners. Some of the most common liabilities are notes payable, accounts payable, accrued liabilities, and anticipated tax liability.

Current liabilities are those items due to be paid within a year. *Long-term*, or *fixed*, liabilities are those items such as debts or parts of debts not due within a year. *Anticipated tax liability* represents the taxes owed on current year profits, even though they will usually be paid out during the following year. *Accrued liabilities* are also expenses that are charged against the profits of the current year. This type of liability might include wages that have accrued but that won't be paid until after the last day of the accounting period.

The assets of your business minus its liabilities equals the *equity*, which is the investment of the owners plus any accumulated profits. If your business is incorporated, your books will show a capital stock account representing the paid-in value of the shares issued to the owners of your business. Undistributed profits are recorded in an earned-surplus account. If your business is a proprietorship or partnership, capital accounts appear under the names of the owners. Increases in equity from undistributed earnings, or decreases from a loss, are also recorded there.

Incredible Shrinking Values. Depreciation and other factors can reduce the value of some assets. Because it's important to get the truest picture possible of your business, the balance sheet is usually set up to show that provisions have been made for such reductions in values. Accounts receivable are analyzed and adjusted by a percentage that will be uncollectable—an "allowance for bad debts." Price changes, theft, or physical deterioration may shrink the value of inventories. Fixed assets decline in value over time, so a periodic allowance is made for depreciation as a deduction from the asset's value.

The profit-and-loss statement of a retailer or wholesaler might include such items as sales, cost of goods sold, selling expenses, general and administrative expenses, and nonoperating income. In most profit-and-loss statements you will see gross margin (sometimes called gross profit) computed first, and then net profit. *Gross margin* is sales less the cost of sales; it doesn't include any expenses for overhead (other than factory overhead), selling expense, or office expense. The *net profit* is the final profit after all costs and expenses for the accounting period have been deducted.

The balance sheet and profit-and-loss statement together constitute one of your most important tools, but they are prepared under conditions of uncertainty, because some of the transactions involved are not complete by the end of the account period. The balance sheet doesn't reflect resale or liquidating values, but only the cost, or cost less depreciation, of the assets held by your business. Your accountant will help you decide which accounting techniques are best for your business.

Now that we've described the balance sheet and the profit-and-loss statement, let's see what we can do with them—using *VisiCalc*.

Figuring Your Format. The first step in creating a balance sheet is deciding on the layout. You will need three columns for data and at least four columns of nine characters each for labels—or sixty-three characters altogether. You'll also want some information in the heading: your company name, report title, date, and section identifiers.

We'll invent a company name, SAMPLE COMPANY, and enter

it beginning at D3. Starting at D5, enter the report title, BALANCE SHEET; and, on the next line at D6, enter the date, JUNE 30, 1982.

We'll use a vertical format, with assets displayed above liabilities and equity. Beginning at D8, enter ASSETS; use equal signs at D9 to underline the word. Now skip a couple of lines and enter all the labels for the asset section.

To make the report a little easier to read, we'll fill in the length of the labeled items with dots, making them all end in the same column near our first column of numbers. Starting at A11, type CURRENT ASSETS:. Then, on the next line, indented a few spaces, begin entering the following labels:

```
CURRENT ASSETS:
   CASH .....
   ACCOUNTS RECEIVABLE .....
      LESS ALLOWANCE FOR
      DOUBTFUL ACCOUNTS .....
   INVENTORIES .....
      LESS ALLOWANCE FOR
      INVENTORY LOSS.....
         TOTAL CURRENT ASSETS .....

FIXED ASSETS:
   MACHINERY .....
      LESS ALLOWANCE FOR
      DEPRECIATION .....
   BUILDINGS .....
      LESS ALLOWANCE FOR
      DEPRECIATION .....
   LAND .....
         TOTAL FIXED ASSETS.....

TOTAL ASSETS .....
```

Two Standouts. Leave one blank line above FIXED ASSETS (line 20) and another above TOTAL ASSETS (line 30) to improve the readability of the report.

Enter the heading LIABILITIES AND EQUITY, starting at C34, and underscore it with equal signs on line 35. At A37, begin the item labels for this section:

```
CURRENT LIABILITIES:
   ACCOUNTS PAYABLE .....
   NOTES PAYABLE .....
   ACCRUED LIABILITIES.....
   ALLOWANCE FOR TAXES .....
         TOTAL CURRENT LIABILITIES .....

EQUITY:
   CAPITAL STOCK .....
   SURPLUS .....
         TOTAL EQUITY .....

TOTAL LIABILITIES AND EQUITY .....
```

Now we're ready to fill in the report with some numbers. We'll use columns E, F, and G for the data. If you're working with a forty-column version of *VisiCalc*, you'll want to fix the labels in column A, so you can see all three columns of data and still know what each row means. To do this, enter /TV with the cursor anywhere in column A.

At F12, enter cash of $30,000 and at E13, enter accounts receivable of $40,000. At E15 we need to include an allowance to cover those accounts we might not collect; this figure could be expressed as a dollar amount, but we'll put it in as a percentage of receivables. Type +E13*.075 and hit the enter key.

Now we can express F15 as dependent upon E15. At F15, type +E13−E15. Each month, as the receivable amount changes, the allowance will be calculated automatically for you. Because we've done a little arithmetic here, we need to draw a line under the allowance to point that out. At line 16, use the insert-row command, /IR, and, with the cursor at E16, put a line of hyphens under the allowance figure.

We want to do the same sort of thing for inventories of $35,000 at E17. At E19, enter +E17*.07; at F19, enter +E17−E19; and at line 20, insert a row and draw lines under E19 and F19, again using hyphens. Next, we'll use the @SUM function to total the current assets from column F and put the result in column G. With the cursor at G21, type @SUM(F12.F19).

Fixed Dollars. Depreciation allowances don't usually change from month to month, so we'll use dollar figures throughout the fixed assets portion of the report. Use $20,000 for machinery and $4,000 for depreciation. Use $28,000 for buildings and $6,000 for their depreciation. Enter these values in column E.

In column F, we'll do a little subtraction. At F26, enter +E24−E26; then move down to F27 and insert a row to underline the data at E26. At F30, enter +E28−E30; move down to E31 and insert another row to underline the data at E30. Enter $14,000 for land at F32; move down to F33 and insert another row to underline the figure at F32.

Now we'll sum the fixed assets from column F. At G34, enter @SUM(F26.F32); underline this amount at G35. At G36, enter @SUM(G21.G34) and underline with equal signs at G37.

For the current liabilities in column F, enter $22,000 for accounts payable, $30,000 for notes payable, $6,300 for accrued liabilities, and $4,000 for tax allowance. In column G at G47, we'll sum these items—with the formula @SUM(F43.F46).

For capital stock, enter $60,000. Surplus is calculated by subtracting stock and total current liabilities from total assets, so at F51 enter +G36−G47−F50.

Total equity, at G52, is the sum of capital stock and surplus, or +F50+F51. Adding together the total current liabilities and total

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equity should give you the same figure you got for total assets. If it doesn't you've made a typo somewhere in your sheet. At G54, enter @SUM(G47.G52) and see how you come out. If you haven't already, don't forget to underline the sums in the liabilities section at F47, F52, and G53 and place equal signs under the total at G55.

The Big Picture. Now let's build the profit-and-loss statement. As soon as we've completed it, we'll be ready to take a closer look at some of the things these two statements can do for us.

As before, we'll begin by setting a heading and the item labels. The business is a wholesaler that we'll call SAMPLE WHOLESALE COMPANY. We'll use columns A, B, C, and D for labels and E, F, and G for data—and, just as we did for the balance sheet, we'll underline sums and draw a line of equal signs under the grand total.

Figure 1 shows the layout of labels and data that we'll use for this report. As before, if you're working in forty columns you'll want to enter a /TV command with the cursor in column A.

Only the raw data is shown in figure 1; we need to finish the report by doing a few calculations. At F13, we'll add E12 and E13, and into F15 we'll put the sum of F11 and F13. At G19, enter +F15−F17, and at G21, find the gross margin by subtracting cost of goods sold from net sales—+G8−G19.

At line 35, in column G, we want to total the selling, administrative, and general expenses by typing @SUM(F25.F32). Profit from operations is found by subtracting this sum from gross margin, +G21−G35. Now, at G40, subtract F40 from F39. Add this result to G37 at G42 to find the net profit before taxes. Finally, at G45, subtract G43 from G42 to get the net profit after income tax.

If you're to get your money's worth from the time it takes to prepare the balance sheet and the profit-and-loss statement, you need to look at some of the relationships between the numbers they present. These relationships are usually expressed as *ratios*. Ratios are generally more useful than dollar amounts for analyzing your business operations. They can help you spot trends in performance or help you compare your company's performance with the average performance of similar businesses.

The Same, Yet Different. There are some things you need to keep in mind, however. Sometimes comparing businesses is like comparing apples to oranges. There's more than one way to record some of the items on a financial statement, so the figures for your business may not appear to correspond to those for the businesses with which you may wish to compare. Because ratios are calculated for specific dates, the financial statements on which they're based need to be prepared frequently; otherwise, seasonal characteristics of your business may be obscured.

Another thing to keep in mind is that although financial statements show what happened in the past, the purpose of ratios is to

	A	B	C	D	E	F	G
1							
2							
3				SAMPLE WHOLESALE COMPANY			
4							
5				PROFIT-AND-LOSS STATEMENT			
6				FOR THE YEAR ENDED JUNE 30, 1982			
7							
8			NET SALES				777630
9			COST OF GOODS SOLD:				
10			BEGINNING INVENTORY ON				
11			JULY 1, 1981			185340	
12			MERCHANDISE PURCHASES		545290		
13			FREIGHT AND DRAYAGE		32110		
14			COST OF GOODS AVAILABLE		----	----	
15			FOR SALE				
16			LESS ENDING INVENTORY ON				
17			JUNE 30, 1982			197130	
18						----	
19			COST OF GOODS SOLD				
20							----
21			GROSS MARGIN				
22							
23			SELLING, ADMINISTRATIVE, & GENERAL				
24			EXPENSES;				
25			SALARIES AND WAGES			99710	
26			RENT			29430	
27			LIGHT, HEAT, & POWER			8480	
28			OTHER EXPENSES			23100	
29			STATE & LOCAL TAX & LICENSE			5310	
30			DEPRECIATION & AMORTIZATION ON				
31			LEASEHOLD IMPROVEMENTS			3130	
32			REPAIRS			1120	
33						----	
34			TOTAL SELLING, ADMINISTRATIVE,				
35			AND GENERAL EXPENSES				
36							----
37			PROFIT FROM OPERATIONS				
38							
39			OTHER INCOME			5750	
40			OTHER EXPENSES			1470	
41						----	----
42			NET PROFIT BEFORE TAXES				
43			PROVISION FOR INCOME TAX				17210
44							----
45			NET PROFIT AFTER INCOME TAX				
46							====

Figure 1.

give you clues to the future, so you can better prepare for the problems and the opportunities ahead.

One of the best known measures of financial strength is the *current ratio*. With it, you can try to determine if your business has enough current assets to meet its current debts with a margin of safety. The current ratio is computed from the balance sheet by dividing current assets by current liabilities.

What's a good ratio? That may depend on the nature of your business and the characteristics of your current assets and liabilities. In the balance sheet we created for the Sample Company, total current assets were $99,550 and total current liabilities came to $62,300. That's a current ratio of 1.59.

If you think your current ratio is too low, how can you change it? You might be able to increase it by paying off some debts, borrowing funds with a maturity of more than a year, converting noncurrent assets into current assets, plowing back profits, or adding new equity.

Fast Test. Another frequently used ratio is the *quick ratio*, or acid test. This is a good measure of liquidity and much more exacting than the current ratio because it doesn't include inventories but concentrates on assets that can be quickly converted to cash. It's the sum of cash, government securities, and receivables, divided by the current liabilities.

For the Sample Company, this is $30,000 cash and $37,000 in receivables divided by current liabilities of $62,300. This gives a quick ratio of 1.07. A quick ratio of 1 isn't bad, provided there's not too much lag in accounts receivable collection behind current liability payments.

If you don't feel comfortable with such a close ratio, you may want to keep your company's ratio somewhat higher. It's generally believed that the higher the ratio the better, especially from your creditors' viewpoint. A high ratio stresses prudence and safety, but you may have to choose between being "lean and mean" and being "safe and fat." How successfully you manage your resources and how hard these resources work for you are the keys.

Some other things you might examine are the average collection period for your accounts receivable, inventory turnover, operating profit, return on owners' equity, net profit on sales, investment turnover, and return on investment.

Calculating the average collection period is a two-step process. First, divide the net sales figure of the profit-and-loss statement, $777,630, by the number of days in the accounting period it covers, 365; this results in a figure of $2,130.49 per day. Next divide the receivables, $37,000, by $2,130.49. The result is 17.36 days.

Knowing how promptly your accounts are being collected tells you how well your credit department is doing. An average collection period is usually considered to be no more than one and one-third times the credit period; on a thirty-day term that means no more than forty days. With an eighteen-day average, our example firm is in excellent shape. If your business is seasonal, you may want to compute the average collection period on a monthly basis to spot any trends toward slower collections.

Turn, Turn, Turnover. Inventory turnover takes the cost of goods sold from the profit-and-loss statement and divides it by the average inventory. The result tells you how many times during the year you turned over, or used up, your average inventory investment. Usually the higher the turnover rate the better, but a high rate can also be an indication of inventory shortages and unhappy customers. The exact right level depends on your particular business.

Turnover can give you a better guide to your business health than inventory size alone because it reflects sales. If inventories increase, it might be to support greater sales, but it could also mean that sales have fallen off. If the inventory turnover rate is declining, that may be a warning that trouble is brewing. Inventory turnover, like the average collection period, should also be calculated monthly.

One of the major objectives of financial management is to determine whether your business is earning as much profit as it should for the amount of money invested. The ratio of operating profit—that is, earnings before interest and taxes—to total assets is a frequently used ratio for appraising the overall earning power of your assets. From our sample balance sheet we divide accounts receivable of $40,000 by total assets of $151,550. The result is approximately .26 or 26 percent.

Another frequently used ratio is return on owners' equity. This measure shows you the return received on your own investment. The average equity is the figure most often used. This is the average of twelve months' figures, or the first and last month of the period if monthly figures are not available. An average drawn from monthly figures presents a more accurate figure, especially when the business involved is seasonal.

From our sample balance sheet we take the total equity figure of $89,250 and add to it the figure from the other eleven months' balance sheets. Then we divide the sum by 12 to get the average equity. For simplicity, let's assume that $89,250 is also our average equity figure. The other value we need to calculate this ratio is net profit. This figure comes from the bottom of the profit-and-loss statement, and in the sample is $28,810. We'll divide the net profit by the average equity, $28,810 divided by $89,250, for a 32 percent return on equity.

What Comes and Goes. The *net profit on sales ratio* measures the difference between what you take in and what you spend doing business. This ratio depends on pricing policies and operating costs. It's most useful when you're trying to compare your figures with those of similar businesses, or when you're examining trends within your own business. If your net profit on sales went down in comparison to a similar period, it might be because you lowered your prices in an effort to increase total sales volume. It might also be that your costs have been creeping up while your prices have remained the same. The full meaning of this ratio is contingent upon other relevant details of your operations.

From our sample profit-and-loss statement, we divide net profit after income tax of $28,810 by net sales of $777,630. Our result is .037, or 3.7 percent. For every dollar of sales, the company made a profit of 3.7 cents.

Investment turnover is the ratio of annual net sales to total investment. It measures the volume of sales for each dollar in assets. We find this by dividing net sales of $777,630 from the profit-and-loss statement by total assets of $151,550 from the balance sheet. The result is 5.13.

Usage of the return-on-investment ratio varies, depending on which specific items from the financial statements are chosen to represent profit and investment. For instance, profit might mean net operating profit, net profit after taxes, or net profit before taxes. Investment could represent total assets or just equity. Whichever values you choose, be consistent from one time to the next. Otherwise, you'll discover yourself comparing apples to oranges.

From our sample, we'll use net profit after taxes (from the profit-and-loss statement) of $28,810, and total assets (from the balance sheet) of $151,550. These figures yield a return on investment of 19 percent ($28,810 divided by $151,550). There are numerous sources of information available that list high, median, and low percent return on investment by line of business.

Tool of the Future. Ratios won't provide you with a crystal ball to solve your financial problems; still they're very important tools that can help you measure the performance of your business. How well you use them determines their real value to you. Comparing your ratios with the averages of other businesses similar to yours and comparing your own ratios for several years should help you spot any unfavorable trends early in the game. Your accountant and tax advisor can help you determine which values are best for you and which ratios will most benefit your particular business. ▲

beginners' corner

by Craig Stinson

The term computer is something of a misnomer. Only a little of what your pc does is—from your point of view—computing. The rest of the time, when it's not doing mathematical work, it's your private secretary, file clerk, teacher, entertainer, and general factotum.

But it would be awkward to call it a programmable digital electronic information processing machine, so the name computer is with us to stay. Furthermore, as we'll see before long, the nature of what the computer does, from its own point of view, is about the same—whether it's working an arithmetic problem, preparing a document, or just sitting around waiting for orders. So if any of these activities deserves to be called computing, perhaps they all do.

But Will It Dice Carrots? The computer is a little like a food processor. You throw something in at one end, let it spin around awhile inside, and before long you get something else out the other end—usually a modified version of what went in. There are some differences between the two devices, however.

Food processors are generally better at analytic work than at synthetic. That is, they're specialized for breaking big pieces into smaller ones, and they're no great shakes at going the other way. Computers are more versatile in this respect.

Another difference is that food processors have a fairly limited repertoire. You can change their blades and control the speed and duration of their performance, but that's about all the variety you have to work with. Your pc, on the other hand, can do more tricks than either you or it can count.

The reason your computer can do so many different things brings us to the crucial difference between the two kinds of machine. The range of choices available to you as food processor operator is determined by the hardware of the machine. What you put in there is your own business, but whether it's a tomato or an onion, the process that occurs when you throw the switch will be the same, and that process is dependent upon such hardware factors as the size and shape of the blade, the speed setting of the motor, and so on.

The Computer as Puppet. The interesting thing about a computer is that what you throw in there itself governs what's going to occur when it gets there. Input controls process.

To be sure, there are plenty of hardware factors that also affect what the computer will do. And in fact, if you scrutinize the situation minutely enough, you'll find that the last paragraph is untrue. Ultimately, it's the hardware of the computer—the multitudinous pathways within its brain and between brain and periphery—that has the final say about what the machine does. But to an extent that's unmatched in any other invention, the computer is a machine that changes its behavior according to the nature of the material given it as input.

The reason the computer is so malleable is that the input material, the analog of the food processor's tomato, is information. The computer is a machine that processes information.

The information you give the computer is, from your point of view, of two types. The first type consists of instructions; the second type is the material upon which the instructions are to be carried out. The first is generally called software, the second, data. To the computer, however, it's all more or less the same.

Everything you put into this magical machine, whether it be a program, a table of accounts receivable, or a move in a chess game, gets converted to electrical signals. The computer distinguishes, by context only, those signals that tell it to take action from those other signals that provide material upon which to act.

What, When, and Where. As a beginner, one of the first things you need to know about computers is what's going where, and when. Where are the programs and data located? How do words get from your fingertips to your monitor screen? Is there any way you might accidentally harm or destroy your valuable data or the computer itself?

In an effort to answer some of those questions, we'll go back over some of the hands-on exercising we did last month in this column, and we'll attempt to provide a little more detail about what was going on in your pc when you turned the machine on, loaded the disk operating system, ran the IBM Samples programs, and then made a backup of your DOS disk. As you'll see, there's a lot that could be said about what was happening inside as you performed those relatively modest operations; we'll get through only part of the scenario this month.

When you turned your machine on, the fan came to life, but nothing much else appeared to happen for a moment. That was because your pc was busy checking itself out, making sure none of its hardware components had developed any defects. This little routine is called the power-on self-test.

Inside your system unit is a device known as an 8088 (see Boards and Buses, page 40). It's one example of an integrated circuit, or chip. Your pc has many of these little black components, but the 8088 is unique among them; it's the microprocessor, the brain of your computer. It's the place where all the processing of information occurs.

Big Brother ROM. The first thing the 8088 does when you turn the power on is consult another chip, called a ROM, for instructions. A ROM is a special kind of memory chip whose contents can be examined but not altered. The name is an acronym for read-only memory; computer people generally use the terms read and write as metaphors for the retrieval and storage of information in a memory device.

ROMs provide permanent storage for information that's fundamental to the operation of the computer. Your pc has six ROMs on the main system board. Among other things, they govern the machine's startup procedures and make it possible for the 8088 to understand instructions coded in the programming language Basic.

Instructions stored in ROM are a permanent consequence of the physical structure of the chip itself. The data is said to be burned into the chip, and once there, is there for good. Such instructions are sometimes referred to as firmware.

After the 8088 has finished checking out your system, it looks to see if you have a floppy disk drive. If you do, it grabs another set of code from ROM that tells it how to go out and read a certain location on the disk in drive A. If that disk is the one from IBM that bears the pink label marked DOS, or if it's a copy thereof or another disk that you've formatted as a system disk (see System Notebook, page 36), then the consequence of the computer's reading that certain location on disk will be that the disk operating system will be loaded into memory—into RAM, to be specific.

Little Brother RAM. Computer people seem to love acronyms. RAM stands for random-access memory. RAM and ROM together make up the internal memory of your computer—internal meaning that it's physically located within the system unit and can't easily be removed and set on a shelf the way a floppy disk can.

There are two differences between RAM and ROM. First, the contents of RAM may be changed; that is, the 8088 may write to RAM as well as read it. Second, RAM's contents are volatile, which means they're wiped clean when you turn the computer off.

The name RAM was chosen to distinguish this kind of memory from storage devices that can only be read or written to sequentially—like tape. Some people prefer to call it read-write memory, to stress its essential difference from ROM, but that name is less popular because it makes for an unpronounceable acronym (unless, perhaps, you happen to be Welsh).

The computer uses an addressing scheme to find its way around in memory. Each location where a datum may be stored is identified by a unique numerical address. These addresses range consecutively from zero on up; the 8088 has the capacity to recognize more than a million addresses.

The lowest-numbered addresses refer to locations within RAM. This would cover the territory from 0 to at least 16,383 and possibly as far as 196,608, depending on how much RAM you bought with your computer. At the other end of the range, the addresses from 999,424 to 1,048,576 are located physically within the pc's six ROM chips. Between these two extremes, starting at address 786,432, is another area of RAM. The data stored here has the special function of controlling your screen display, and the chips that hold this data are located on your display adapter card.

The rest of the 8088's memory range, on the pc, consists of vacant addresses. The *IBM Technical Reference Manual*'s memory map (pages 2—26 and 2—27) shows a couple of large gaps marked only as "future expansion" areas.

The amount of RAM you have in your pc determines to a large extent what kind of programs you'll be able to run. That's because RAM is the computer's working area. Whenever you run a piece of applications software, like an accounting program, a game, or a word processor, the program instructions are held in RAM. So is any data that you create or use.

There are a couple of reasons why the computer needs this internal workspace, in addition to the storage provided by your floppy disk. The first is speed. The amount of time it takes to shuffle information in and out of the 8088 from RAM is on the order of a millionth of a second. Disk access is exceedingly slow by comparison.

The second reason is that the 8088 needs a scratch space for carrying out its orders, much as you might need a pencil and paper when doing calculations by hand. It has to have room to store information temporarily while it's doing its work. The disk, on the other hand, is intended for permanent storage.

Big Daddy DOS. Meanwhile, back to our scenario. After your pc has passed its power-on test, the 8088 sends for information from the disk in drive A, and if that disk is a DOS system disk, the set of instructions that comprises the disk operating system is loaded into random-access memory.

This body of code, DOS, falls under the category of system software. That means that it contains instructions relating to fundamental housekeeping functions—such things as filing data on disk, moving files from one disk to another, and so on.

Note that we've now encountered two levels of instructions for the 8088—the firmware that got the computer up and running in the first place and the disk operating system—and we're still only talking about what you might call background operations. Before we get to running the IBM Samples programs, we'll encounter yet another body of system software, called Basic.

We'll have more to say about Basic, the Samples programs, and the backup procedures when we continue this discussion next month. ▲

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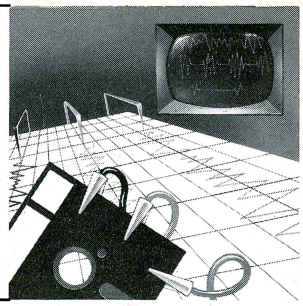


Unless otherwise indicated, software reviewed runs in DOS on machines with either display adapter and requires at least one disk drive.

Deadline. By David Lebling and Marc Blank. A millionaire philanthropist has been found dead of an apparent drug overdose in his library. You, the chief of detectives, have received a letter from the attorney of the deceased requesting that you be present at the reading of the will and have a look around while you're there. There is also the matter of the possible existence of a new will, made by the dear departed immediately prior to his departure, but subsequently, shall we say . . . misplaced.

You are armed with an inspector's casebook, excerpts of suspect interrogations, the report of the medical examiner, and a packet of "tablets found near the body" (physical evidence).

If the Mystery Writers of America gave an award for Best Fiction in Software, *Deadline* would win in a walk. Of course, it has little competition, but besides being a well-written program (with a vocabulary of more than 600 words that takes full-sentence commands), it is well *written*. This is an elegant mystery, with its roots in Agatha Christie rather than Mickey Spillane. Virtually all the suspects have you, the detective, outclassed by a mile in poise, class, and resourcefulness, and they love to let you know it in a number of subtle ways. You are bound to feel more like Lieutenant Columbo than Nick or Nora Charles as you muddle about these haunts of the very rich.

The parameters of your investigation are the entire house and grounds, and the authors have loaded the whole estate into their program, down to the last garden hoe, toothbrush, and ancestral portrait. It's a real place, and every object in it is really there. It is a big program, though its speed (machine language) belies its bulk. Its sentence-comprehension ability can require painstaking prompts on the placement of the verb in relation to the subject, and results in an occasional non sequitur response, but once you get the hang of it, things can become rather chatty. If the program can't answer, it always tells you why, and it demonstrates a laconic wit in anticipating a lot of the sillier commands that may float into your head during the frustrating passages of the game.

Those passages are many. It's easy to feel lost and helpless in *Deadline*. There is no treasure; you have no weapons, no adversaries, and no quest—save for the truth and evidence to back it up. Your surroundings are of the familiar, mundane world and are largely inert; it's totally up to you to make sense of the world in which you find yourself.

The disciplines required in *Deadline* are like those of no other adventure. You don't get to see a point score mount encouragingly, and you can't even know if you're on the right track. You need to have a real grasp of deductive reasoning and a feel for minutiae. Linear thinking and direct action will get you zip. Your success is dependent on how strong a case you can make based on your accumulated evidence.

The variables for subsequent plays of the game are somewhat restricted—the facts of the murder, the method, and the culprit don't change—but even though it's always the same mystery, you are not likely to get a conviction your first time through, and will have to go back and reconstruct events again, searching for the evidence that will clinch your case. Therein lies the variety of *Deadline*. For anyone who ever loved a mystery—and who has a couple days free—it's indispensible. OC

Deadline, by David Lebling and Marc Blank, Infocom (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031). $49.95.

EasyWriter II. This word processor is not to be confused with the *EasyWriter* marketed by IBM. It is an original program, distinct from the earlier versions of *EasyWriter* and, indeed, from any other program on the market.

The first thing that strikes you about *EasyWriter II*—it's self-booting! You just stick in the disk and turn on the machine. The program appears to have its own DOS; there is no need to write DOS onto the disk before using the program.

The next thing you notice—*EW II* lives up to its name. The program explains itself; it is largely menu-driven. If you do have trouble, you can hit the F2 (help) key for an explanation. There is a sticker you can put on the keyboard that describes the fonts and function keys. With this assistance, you can be off and typing with scarcely a glance at the documentation (which is itself commendably clear and instructive).

EasyWriter II requires two disk drives but uses them well. The package includes three disks: a system disk, a housekeeping disk, and a sample document disk. The first is the word processor, the second contains various utilities (including one to provide backup copies), and the third includes an introduction and tutorial. In order to use the program effectively, it is necessary to format a data disk, using the utilities (a PC-DOS-formatted disk does not suffice). The data disk stays in drive B. Your files are automatically updated on disk every time you change pages or hit the escape key to return to the main menu.

EasyWriter II takes full advantage of the IBM keyboard, including the tab, insert, delete, and arrow keys. The keyboard buffer is functional; you can give commands while the disk drive is turning. The function keys give the program a unique flavor. By hitting a single key, you can enter any of five modes: character, word, line, sentence, or page. (As if that weren't enough, you can hit shift-F5 to enter the paragraph mode.) The mode you are in affects several other keys. F9 (previous) and F10 (next) may shift you a page, a single character, or anything in between, depending on the mode. Similarly, insert and delete will affect anything from a character to a whole page. To be sure, it can be troublesome remembering which mode you are in. However, the mode is displayed at the top of the screen at all times, and there is error trapping to prevent you from deleting a page accidentally.

Also at the top of the screen, *EW II* displays information that allows you to locate yourself precisely, by document number, page, line, and space. In addition, the program tells you how close your disk is to being full. There is also a "ruler" at the top of the page that shows the margins and tabs. Changing the ruler (which also controls things like spacing) is easily accomplished, and a ruler can be saved for use on a different manuscript. Furthermore, it is possible to change rulers in the middle of a document, which means that you have considerable freedom to change your format. Because a

manuscript is printed in the same form in which it appears on the screen, it is also possible to do some elaborate things without worrying about the ruler.

On top of all these friendly features, there are several advanced options. The program supports several fonts—bold, underline, double underline, shadow printing, superscript and subscript (not all of which are possible on the standard IBM printer). It is possible to "cut and paste," transferring blocks of text within documents or even between documents. There is provision for headers and footers to appear, respectively, on the top and bottom of every page. There is a search and replace function, and provision for merging portions of one document with another (to create form letters, for example). Finally, instructions are given for transferring files to and from *VisiCalc* and IUS's *EasySpeller* and *EasyFiler.*

With a pacesetting program like this, you can be sure there are problems. For example, if you forget which mode you are in (or hit a key accidentally) and insert a page by mistake, then hit shift-F2 (cancel) to correct the error, you lose text permanently. The otherwise useful search and replace function is no help if the word you are looking for is in a special font. The adjust text function tends to erase all indents. If you paginate double-spaced text and go directly to the printer, you not only get every other line blank, you get every other page blank too.

Despite the glitches, *EasyWriter II* is an excellent word processor, the best yet from IUS. fj

EasyWriter II, Information Unlimited Software (281 Arlington Avenue, Berkeley, CA 94707; 415-525-9452). $350.

CompuCube. By Richard Stauduhar. In the beginning there was The Cube. Then came the bestselling books promising easy solutions. Now there's a program from Stoneware that does the whole thing for you.

The "whole thing" is, of course, Rubik's Cube, the frustrating invention of a Hungarian professor and the hula-hoop of the Me Generation. But dedicated cubists need no longer sprain brain and wrist attempting to contort their puzzles to achieve Rubik's heaven, a cube where each colored square resides on its proper face: *CompuCube* is both an electronic cube and a solution tutor.

The program starts with a solved cube that you may either sit and admire, scramble, or preset to any combination of squares you desire. The last two options provide all the frustrations and opportunities of the real thing—with a few added distractions that are the nature of the computerized beast.

Commands are necessarily complicated, given the cube's construction and its 43 quintillion possible arrangements. Some may find it difficult at first to follow the program's three-dimensional movements on a two-dimensional screen. Additional confusion may arise from *CompuCube*'s three display modes (for monochrome, composite color, and RGB color monitors); each has a different color or shading scheme, and each is different from the Rubik's Cubes sold in toy stores.

The program's best feature is the option it gives the nerve-racked player to surrender and let the pc take over. *CompuCube* will solve its own puzzle or, with a preset routine, solve the real cube you've been working on since last Christmas. (Be careful when constructing a cube on the screen; there are sixty-four squares, six colors, and no error-trapping. A mistake here can create an ersatz cube or literally send you back to square one.)

Other features include a colorful introduction with the program's only music, and a 2 x 2 x 2 cube for those who prefer a puzzle with a few billion less possibilities (no solution phase here; you're on your own). You can also save cubes, turn the cube display to any angle, and create patterns not possible on real cubes.

CompuCube is not a better puzzle. The three-dimensional version is both easier to conceptualize and to manipulate. It does, however, do the solve-the-cube books one better and is bound to attract aficionados of the game.

Amateurs are likely to find more satisfaction in the real thing—and people with a history of nervous disorders are advised to avoid these cubes in *any* form. rw

CompuCube, by Richard Stauduhar, Stoneware (50 Belvedere Street, San Rafael, CA 94901; 415-454-6500). $29.95.

Hewlett-Packard HP7470A Graphics Plotter. A graphics plotter is an automated drafting device that moves pen over paper to the most precise measurements—to the thousandth of an inch in the case of the *HP7470A.* This plotter, with appropriate software, can draft floor plans for buildings, or draw bar, pie, or line charts for business use. It can draw on letter-sized paper or on metric ISO A4 (210 x 297 mm). It can even draw on a transparency for use with overhead projectors—convenient for board meetings.

The *7470A* offers both fast plotting and great line quality. Rubber pinch rollers hold the edges of the form in place over low-inertia, grit-covered drive wheels that move the paper along one axis, while the drafting pen moves along the other. The grit wheels leave small indentations in the paper, keeping it from slipping out of alignment; everything thus remains precisely positioned.

The pen itself can be chosen automatically from one of two pen stalls. The pens are gently dropped to the paper by a special damping mechanism that protects them from possible "mushrooming." The pen moves with approximately two Gs of acceleration and a maximum velocity of fifteen inches per second.

If you want to use more than two colors on a graph or drawing, you can put a pause in your program to change pens. Up to ten different colors of ink are available for the *7470A.* For multiple graph overlays, lines can be drawn in any of seven dashed patterns.

Although the *7470A* can be outrun by even the slowest of printers, it will manage up to six characters per second, allowing easy labeling of graphs. A choice of five character sets, including three European ones, is available. Letters can be drawn in any position—upside down or sideways, as well as right-side up—with or without slant.

What sets the *7470A* apart from graphics printers is its ability to draw straight lines in any direction. Dot matrix printers can only draw a line as a series of dots; hence diagonal lines often look like staircases.

Besides plotting graphs and other kinds of displays, the *7470A* can also be used as a digitizer. Its pen can be replaced by a sight; you can then maneuver this sight over a piece of artwork and send x and y coordinates to the computer. This procedure permits you to convert points, lines, and curves into data the computer can store, analyze, and subsequently redraw on screen.

Both plotting and digitizing on the *7470A* are accomplished with the help of a special Hewlett-Packard graphics language (known as HPGL). Forty-two two-letter mnemonic instructions control the plotter's actions. Thirteen codes control character parameters and plotting; five more are used with digitizing. Twelve others affect pen movement and line drawing, and another twelve are for input, setting, and control of plotting parameters. Included in HPGL are instructions concerning scale factors, error masking, defaults, plotting windows, plotter status, pen position, pen velocity, and acceleration. The last two give you the freedom to slow down pen movement to prevent skipping or uneven lines when drawing transparencies.

Included with the *7470A* are three books: an operator's manual, an interconnection guide, and an interfacing and programming manual. Also included are a programmer's reference card, fifty sheets of plotter paper (best for use in the *7470A,* although bond paper is okay), and four plotter pens (red, blue, green, and black).

The operator's manual is handy if you want to learn to use the plotter but aren't interested in programming details. Those details, including the graphics language, are covered in the interfacing and programming manual. All three books are professionally done and easy to read.

The *7470A* is connected to the computer by a serial interface (RS232-C/CCITT v.24). Three wires connect the computer and plotter. You can also equip the *7470A* with an optional serial interface that passes transmit and receive lines through the plotter, allowing it to interpose a terminal and modem; in this arrangement special codes are used to run the plotter.

The *7470A* is designed to connect to various computers. Be sure you order the interface that's correct for your equipment, since you won't be able to change from one interface to another without ordering a whole new plotter (the interface is an integral part of the plotter circuitry and cannot be removed or exchanged). rk

HP7470A Graphics Plotter, Hewlett-Packard (16399 West Bernardo Drive, San Diego, CA 92127; 714-487-4100). $1,550.

Zork II. By David Lebling and Marc Blank. This is a sequel to *Zork I*, although the earlier program is not needed for play.

Like *Zork I*, this is a text adventure in which a heroic traveler explores the remnants of the Great Underground Empire. Again, Lebling and Blank employ a sentence-parsing routine to allow commands in the form of complex sentences. Those who have color monitors will see an attractive red, white, and blue display. A status line at the top of the screen lets you know where you are and how many turns have elapsed. The adventure is a series of strange rooms, curious objects, and dangerous monsters, combined into a devilishly intricate series of puzzles.

Zork II is, however, a fresh, original adventure. There is a helpful robot, an elusive unicorn, a princess who needs rescuing, and a demon who demands all of your treasure. The most interesting character is the Wizard of Frobozz, a frivolous sorcerer who keeps popping up and casting bothersome spells. In addition, your character may find himself floating in a balloon, talking to the Gnome of Zurich, or shrinking until he is only four inches tall.

In some ways, *Zork II* is more difficult to solve than its predecessor. Most of the creatures in *II* cannot be harmed by your sword—or even by bombs or poison. Yet it's necessary to solve almost all the puzzles to complete the adventure. A little bad luck and even the most clever fortune-hunter will leave his bones in the cavern.

While other companies are producing adventures with graphics and whizz-bang excitement, Infocom has shown that there is still a market for well-designed text adventures. fj

Zork II, by David Lebling and Marc Blank, Infocom (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031). $39.95.

Temple of Apshai. By Jeff Johnson, Jon Freeman, and J. W. Connelley. *Temple of Apshai* has long been a popular game for the Apple II. No surprise, then, that it's now a bestseller for the pc. The translated game requires a color adapter, which it uses to good effect.

Temple is a graphics adventure. Unlike a text adventure, it displays your character's environment. Following the familiar Automated Simulations formula, the character is shown as a figure on a map of the temple. Single keystrokes govern his movement through the maze and in combat with the skillfully drawn monsters that keep popping up around him. A variety of sounds punctuate your character's progress—his stepping on a trap, discovering a secret door, or doing battle with a giant fire beetle. Conveniently, the sounds can be turned off if you get tired of them. The game is in real time, so, if you leave the computer to get a cup of coffee, you may find your character has been eaten by a monster in the interval.

The most pleasant thing about playing *Temple* is that you have your own unique character whom you can save from game to game. Each character is defined by six characteristics: intelligence, intuition, ego, strength, constitution, and dexterity, each of which has a considerable impact on play. Moreover, you determine how your character is equipped, budgeting silver pieces to buy armor and weapons. With its four levels, *Temple* gives your hero plenty of opportunity to advance from game to game.

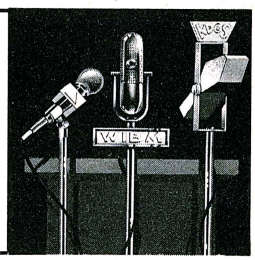
Now the bad part: getting through the temple is a pain. An average character has a less-than-average chance of surviving the first level, and no chance at all on the fourth, where even the best character may become food for a ghoul or an insect man. To make things worse, the temple is huge, and too much of it is empty space. It can take thirty keystrokes to cross the screen and perhaps ten screens to reach an interesting area of the temple (at which point you may have to turn right around because you are wounded or out of arrows).

There are also a number of small glitches that oppress your hapless adventurer. Traps often appear in one place and go off in another. Values given in the documentation often do not match those on the screen. Commands are sometimes executed in reverse order when they come out of the buffer. The character has no opportunity to buy healing elixirs or magic arrows, both important to his quest. Some of the early copies of the program crashed repeatedly. (If this happens to you, try to *goto* or *gosub* a line following the error.)

Despite these flaws, *Temple of Apshai* deserves its place on the bestseller list. The translation is hasty, but the game still has much of the action and intrigue that won it awards on the Apple. fj

Temple of Apshai, by Jeff Johnson, Jon Freeman, and J. W. Connelley, Automated Simulations (Box 4247, Mountain View, CA 94040; 415-964-8021). $39.95. ▲

marketalk news



Unless otherwise indicated, software listed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

Δ **IBM** (Box 1328, Boca Raton, FL 33432; 305-998-6007) has announced the release of *EasyWriter 1.1*, an update to the word processor that arrived on the market with the pc last August. The revision is said to offer improvements in insertion and deletion of text, easier use of control keys and menus, and the option of storing documents as individual DOS files. The manual has been revised as well. Purchasers of the original release, version 1.0, may exchange it for the update at no cost until December 31. $175. Δ From the **IBM System Products Division** (1000 N.W. 51st Street, Boca Raton, FL 33432), you may purchase the *RS 1*, a pc-programmable robotic system. $28,500.

Δ Two members of the *Visiseries* from **VisiCorp** (2895 Zanker Road, San Jose, CA 95134; 408-946-9000) will make their pc debuts in July: *VisiTrend/VisiPlot* and *VisiDex*. The former is a combination graphing and statistical analysis package specialized for time-series applications. Both halves of the package, *Trend* and *Plot*, produce and use data in the DIF format, facilitating the transfer of information in and out of *VisiCalc* models. *VisiDex* is a combination short-take database and agenda manager. Records are a maximum of one screenful in size and are filed under user-designated key-

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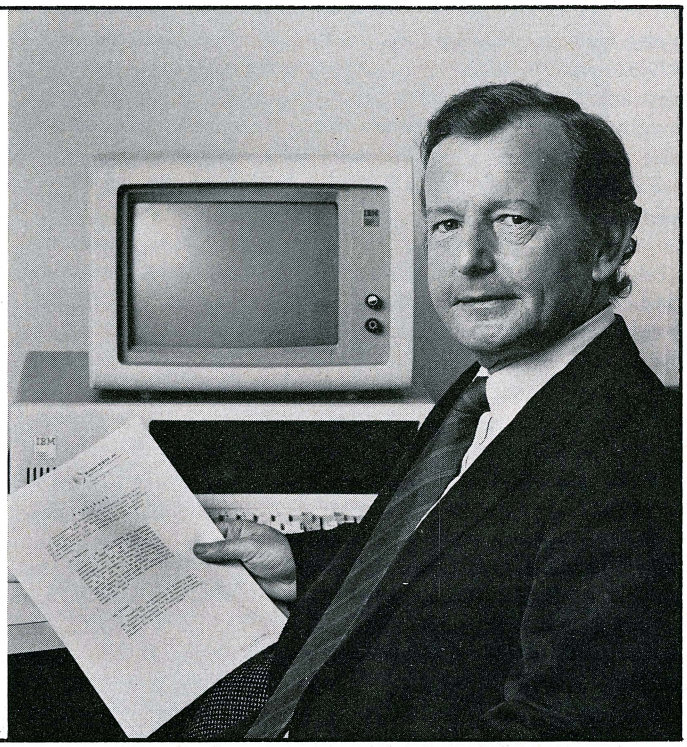

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words. The result is an automatically cross-referenced electronic card file. The program also allows the storage of dated reminders that emerge automatically from disk on the appropriate dates. *VisiTrend/VisiPlot* requires color/graphics adapter for plotting modules. $300. *VisiDex*, $250.

Δ From **High Technology Software** (2201 N.E. 63rd, Oklahoma City, OK 73113; 405-478-2105): *Job Control System* provides manufacturers up-to-the-minute reports on job status and costs of production. P-System, $750. Δ *PACE* (Prompt Accurate Cost Estimator) is designed to do what the name implies. Intended users are contractors, subcontractors, and other manufacturers. P-System, $395. Δ *Gusher* is an accounting program tailored to the needs of the oil and gas industries. P-System, $995.

Δ **Micro-Z Applications** (Box 2426, Rolling Hills, CA 90274; 213-377-1640) offers *Print Graph*, a series of programs that permit you to print out medium and high-resolution graphics, in several sizes, on IBM or Epson printers equipped with Graftrax PROMs. *Print Graph* also contains programs that create line or bar charts with titles. $79.50; with Graftrax, $149.50. Δ Same company's *MXPlus* performs automatic perf-skip to provide controllable top and bottom margins on each printout page and offers front-panel control of type size and style. $49.95 Δ For something completely different, Micro-Z offers *Millionaire*, a stock market simulation game. $49.95.

Δ *SuperCalc* is the spreadsheet simulator from **Sorcim** (405 Aldo Avenue, Santa Clara, CA 95050; 408-727-7634). The program performs calculations upon and prints reports from data oriented in rows and columns. It has a facility for creating read-only data and allows columns of varying widths within a single model. $295.

Δ *Communicator/Text Editor* from **Electronic Data Systems Corporation** (7171 Forest Lane, Dallas, TX 75230; 214-661-6621) works in conjunction with the Hayes Stack Smartmodem to transfer text, *VisiCalc* files, or programs in text format between the pc and any Bell 103 compatible system. The editor features line edit, global search and replace, move, copy, swap, delete, and hex list. Requires eighty-column monitor. $180.

Δ **Osborne/McGraw-Hill** (630 Bancroft Way, Berkeley, CA 94710; 415-548-2805) has two books scheduled for release in July that will be of interest to pc owners: the second edition of the *CP/M User Guide*, by Thom Hogan, and *Some Common Pascal Programs*. The CP/M volume has been revised and expanded to cover CP/M-86. *Some Common Pascal Programs* is a translation to standard Pascal of an earlier work, *Some Common Basic Programs*. The Basic version was edited by Lon Poole and translated to Pascal by Greg Davidson. Both books in paperback. *CP/M User Guide*, $15.95; *Some Common Pascal Programs*, $14.99.

Δ **Intermedia Systems** (10601 South Saratoga-Sunnyvale Road, Cupertino, CA 95014; 408-996-0900) offers a one-year warranty on its 192K 4192 Memory Expansion Module card. $1,095.

Δ *Household Aids* is a set of home utilities from **NF Ssytems** (Box 76363, Atlanta, GA 30358; 404-252-3302). The six subprograms are for household inventory, vital records, a video cassette index, resume, a personal statement (including such things as banking relations, account numbers, insurance policies, and serial numbers), and a phone-address list. $49.95.

Δ *The Speed Reader*, from **Davidson and Associates** (6069 Groveoak Place #14, Rancho Palos Verdes, CA 90274; 213-378-7826), offers a ten-lesson course designed to increase both reading speed and comprehension. $74.95.

Δ **Acorn Software Products** (634 North Carolina Avenue S.E., Washington, D.C. 20003; 202-544-4259) has announced its first three products for the pc. *Everest Explorer* is a logistics simulation game. Can you manage your men and materiel for a successful assault? Requires eighty-column monitor. $19.95 Δ *Money Manager* handles a real-life management problem: your family's finances. One hundred accounting categories are provided, including one reserved for tax-deductible entries. The program also allows multiple-category disbursements and automatic teller transactions. Requires eighty-column display. $39.95. Δ Extraterrestrial economic problems are the subject of *Lost Colony*, a game in which you must develop and conserve resources in a stranded space colony. Requires eighty-column monitor. $29.95.

Δ An alternative green screen for the pc mono adapter is available using a cable from **Jack Strick and Associates** (949 South Lake Drive, Hollywood, FL 33019; 305-925-7004). Twelve-inch NEC monitor with Strick's cable, $249.95. Δ An RGB color cable for the Sony Profeel, $69.95. Δ A program that allows you to use the print-screen key to dump graphics to the Epson or IBM printer, $24.95. Δ *Transfile*, a program to transfer files between the TRS-80 and the pc, $199.95.

Δ **Sun Coast Data Sciences** (680 Center Street, Costa Mesa, CA 92627; 714-631-9241) has announced *Math Master*, which offers software support for the Intel 8087. *Math Master* can be used to pass and return parameters of programs written in IBM Fortran, Cobol, Pascal, or a compiler-based Basic. A separate package will be offered for use with IBM's Basic Interpreter. Claims speed increase ranging from a factor of seventy-eight for double-precision multiplication to a factor of 544 for square root calculations. With matched 8088-8087 pair, $450.

Δ **North American Business Systems** (677 Craig Road, Suite 202, St. Louis, MO 63141; 800-325-1485) has taken a very aggressive policy in promoting its program *Answer*. The company is sending out eleven "VIP kits" to each dealer, to be distributed one to a customer. Each kit includes a one-hour demonstration disk. In addition, there are instructions, a copy of a review, some sales literature, and a promotional button. *Answer* is an index card system with a split screen and a cross-referencing function that directs you to the diskette holding the information you seek. Two disk drives recommended. $250.

Δ *RL-1* is a relational database management system from **ABW** (Box M1047, Ann Arbor, MI 48106; 313-971-9364). It features a high-level query language, similar to SQL, that uses simple English phrases to control selection, projection, and join operations. A set of utility programs is included to facilitate transfer of data between *RL-1* and other programs or machines. $495.

Δ **Chang Laboratories** (10228 North Stelling Road, Cupertino, CA 95014; 408-725-8088) produces a set of financial programs for users of CP/M-86. *MicroPlan* is a menu-driven electronic worksheet designed for such applications as depreciation calculation, loan analysis, internal rate of return calculation, forward operations, and rolling forecasts. The *MicroPlan Consolidation Module* handles three kinds of multiple-table consolidations and figures variances. A statistical module is in preparation. All require CP/M-86 and Digital Research's CBasic-86 language. *MicroPlan*, $495; *Consolidation Module*, $295.

Δ *The Norton Utilities* from **Peter Norton** (1716 Main Street, Venice, CA 90291) currently consist of four items: *Disklook, Unerase, Secmod*, and *Filehide*. *Disklook* is a general-purpose snooper that will show you formatted directory listings, sector displays, file location maps, erased file names, and more. *Unerase* recovers deleted files. *Secmod* reads any normal disk sector, displays its contents, and accepts modifications in either hex or ASCII. *Filehide* sets or resets the file attributes of Hidden and System. All require eighty-column display. *Filehide*, $10; other three programs, $20 each.

Δ **Personal Micro Computers** (475 Ellis Street, Mountain View, CA 94043; 415-962-0220) makes an interface cable and adapter that will let you drive an IBM Selectric or equivalent typewriter from your pc. $595.

Δ *The 420 Color Printer* from **Envision** (683 River Oaks Parkway, San Jose, CA 95134; 408-946-9755) permits use of four colored ribbon cartridges and offers choice of 300 or 100 characters per second from an eighteen-wired dot-matrix printhead. Two sixteen-bit microprocessors enable buffering to 128K. $3,950. ▲

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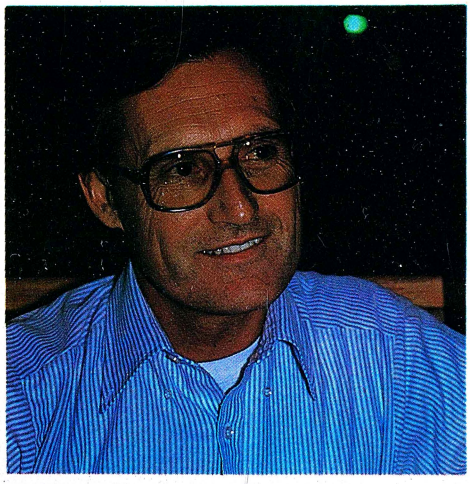
User Groups: A Little Help From Our Friends

by Forrest Johnson and David Hunter



Dave Wood: "Using a pc is not as easy as you think."

As the advertisement says: "There was a time when all computers were big. They were also costly and complex."

The Personal Computer is not big or costly or terribly complex. Veteran users of IBM 370s and the like are finding the Personal Computer a sporty, good handling little machine that's simple to use yet powerful enough for serious applications. But for the inexperienced and for the computer illiterate, a pc can be very complicated and not so easy to use.

You find both kinds of people at a typical user group meeting. In the simplest terms, a user group is a small gathering of people whose one common experience is owning a personal computer.

On the Bayou. User groups meet anywhere that's convenient: in college classrooms, in computer stores, in living rooms, and even on the beach (provided there's proper electric current there). Meetings may take place once a month or more frequently.

The San Diego Computer Society IBM SIG (special interest group) meets every third Tuesday of the month. The only public user group in the San Diego area, it's not in competition with the Cubic Computer Club, a corporate group meeting at Cubic-Western Data in San Diego. The Computer Society's SIG is organized by John Field and congregates at Computerland of La Mesa.

Each user group must have a leader or leaders. Field is the brave fellow who gets up in front of the San Diego SIG and leads them through the first part of the meeting. An experienced programmer, Field formed the group because he wanted to know what other people were doing. He had never organized anything like this before, but the SIG has been quite successful after four meetings, gaining new members each time.

The San Diego SIG meetings, a good example of typical user group activity, begin with a report from Field relaying information on new products and publications. At this point in the meeting there's also general discussion of important topics as they pop up.

Where's the Serial Number? Typical subjects for group discussion include problems users have had with specific products, group purchases, suggestions for future meetings, rumors, and any other pertinent controversies. Members are encouraged to speak up, to share their views or information with the group. Certain subjects, like the determination of a good brand of disk, lend themselves well to this group discussion method.

And yet Field is concerned that there still isn't enough feedback or "crosstalk." The current size of this group, forty or so, can account for shyness in those members who are easily intimidated. As in a classroom situation, there are bound to be students eager to participate and less confident students there mainly to observe.

Field would like to start smaller meetings in addition to the large monthly gatherings. Specific topics, such as programming in assembler or graphics techniques, would be the focus of small meetings held according to the demand. Ideally, these auxiliary get-togethers would be much smaller, offering the individual better exposure to specific information.

The second part of the San Diego SIG meetings is taken up with demonstrations of products, either by outside companies or members of the group. At the June meeting, member Frank Schiele showed everybody his *Full Screen Editor*, a program he wrote in assembler. The group crowded around a pc as Schiele demonstrated the functions of the homemade text editor.

Schiele plans to market *Full Screen Editor*, but such aspirations aren't necessary to capture the group's interest. Along with programs like Schiele's, other, less complex programs authored by members are kept in a library by Carol Shannon. Available to all members, a collection of software like this is invaluable, particularly in these pioneer days when the commercial software market for the pc has not yet reached maturity.

President Don McDonald and other representatives of Persyst Systems Technology were also present June 13 to demonstrate their expandable memory board and the Spectrum multifunction board. As everyone soon discovered, it's difficult to demonstrate a memory expansion board on the pc without a specific application. McDonald ran diagnostic tests and answered questions—which seemed to do the trick.

Presentations over, the SIG broke up into small groups for the last part of the meeting. Members were given a chance to mingle and engage in conversation, to reach out for help or new information. This last portion of the meeting is often the best. Friendships can be born.

Start the Presses! The San Diego SIG puts out a monthly newsletter that has grown from two pages to eight in just one issue. Club news and short features are included, complementing the group meetings.

Presentations and newsletters aside, the real worth of a user group depends upon its members and their major focus of effort. If you go to a meeting where everyone is involved with systems programming and you're stuck on Basic, it can be a wasted trip.

Similarly, if you have some knotty problem with writing printer commands and the meeting you eagerly attend only gets around to inserting floppies and turning on the monitor, it can get frustrat-

ing. The San Diego SIG is not one of these extreme cases. The major concern of this group is the IBM Personal Computer in *all* its splendor.

Dave Wood, an employee of the city of San Diego, attended his first SIG meeting on June 13, and it has met his expectations. Wood says he's learned to use *VisiCalc* but is still unclear about all the pc's capabilities. Wood came to the SIG meeting looking for information to take the mystery out of computing.

Sharing information is also important to a more established user like Guy Moore of National Advanced Systems. Moore has attended all the San Diego SIG meetings and is drawn by the opportunity to encounter experienced users. He wants to learn anything other people are willing to teach.

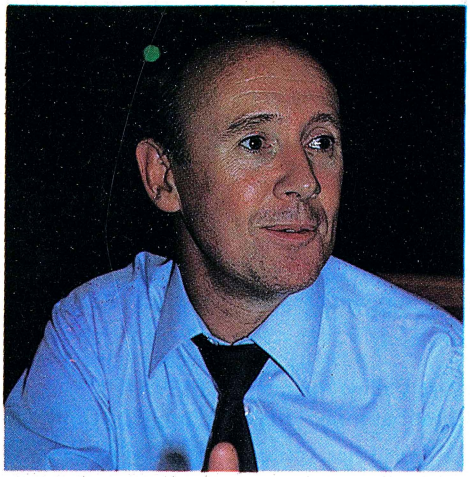
Guy M. Kelly is a senior technical specialist in research and development for Cubic-Western Data and attends both the SIG and Cubic Computer Club meetings regularly. Experienced in many kinds of computing, Kelly feels the Cubic group concentrates on technical material suitable for engineers and programmers, while the Computer Society's SIG is more business oriented. Kelly is one of those individuals who add greatly to user group meetings, bringing much needed experience and knowledge.

Something Has Been Happening to Computers. User groups should always be democratic in nature. In the San Diego SIG everyone from veteran IBM sluggers to novices is on equal footing, encouraged to speak their minds. Personalities may clash from time to time, but if everyone is courteous the resulting chemistry can be magic.

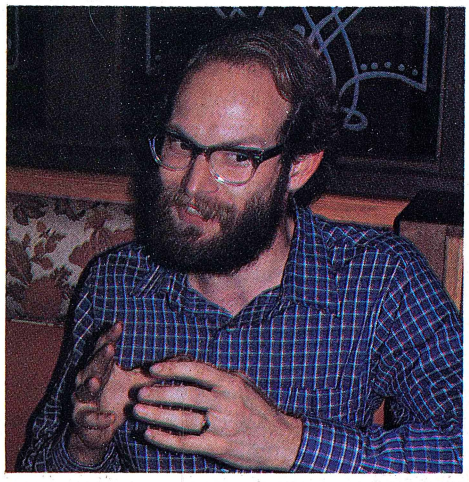
In pioneer days, families and individuals banded together to share knowledge and resources. The environment was hostile and strength was measured in numbers. Life was a daily struggle with many forms of death.

Although it's possible to be a loner, braving the wilds of microcomputing with only your wits and pc, camaraderie and teamwork are the best bets for less hardened individuals. User groups may only be the first leg of a long and wonderful journey, but a good beginning ensures at least a partially successful trip. ▲

Guy M. Kelly: "I think the IBM pc will become the standard for microcomputers."



John Field: "One way to serve members better is to break the group up intelligently into subgroups."



Guy Moore: "I'm fanatic about IBM mainframes. Compared to a pc, they're dinosaurs, yet not quite obsolete."

User Groups: What and Why

Where can I get help?

Sooner or later, this question will confront every pc owner. Perhaps you have a problem your local computer store isn't equipped to deal with. Perhaps you are interested in a program you have seen advertised, for which there is no published review. Perhaps you're interested in a new application but aren't sure how to implement it or even whether it can be done on the pc.

In many cases, the best-informed and friendliest source of information is your local user group. There are now at least forty user groups forming or already meeting regularly around the country, and more will be organized in coming months.

What to Expect. Don't expect a steel-and-glass building with a big sign—"IBM User Group"—in front. A user group is just a club of people who happen to own the same brand of machine. Often, it meets in a Computerland store, a home, or a public building. The members share information and trade public-domain programs. Sometimes one will report on a new product or technique. Members may also get together and buy hardware or software in quantity and at a discount. If a victim can be found to publish it, there is a Xeroxed or mimeographed newsletter. At least one group maintains a bulletin board on which users with modems can leave messages relating to the Personal Computer.

Although user groups are similar in purpose and function, they differ greatly in organization. Most are simply local clubs, but others are part of larger organizations. For example, the mammoth Boston Computer Society sponsors an IBM interest group, as well as fifteen other groups. There are obvious advantages to being part of an organization that can maintain offices and publish a magazine.

Some local groups are chapters of the national organization Autumn Revolution (of which we'll hear more later). Some are centered in corporations. IBM employees have several such groups scattered around the country.

Computing at Cubic. Most corporate user groups are not open to outsiders, and therefore are not listed in this article. An exception is the Cubic Computer Club in San Diego, where about 15 percent of the members are nonemployees. Cubic, a defense electronics corporation, has an enlightened policy toward its in-house computer club. To buy a computer, an employee can apply for an advance against his salary. This amounts to an interest-free loan. The employee may buy any computer, but the pc is recommended.

In return, members can use their computers for work, and some bring them into the office. They are planning to tie their machines into the company's mainframe computer, which will allow them to transfer files easily and perhaps even to work at home.

The benefits to Cubic are obvious. They now have over twenty-five machines and members with expertise that puts them far ahead of the marketplace. For example, months before double-sided disk drives became available, Cubic employees had already wired their machines for double-sided disks. Right now, some members are experimenting with 8087 chips, even though they will not be available to most users until later this year.

Encouraged by the company policy, some club members have gone far beyond their initial loans to upgrade their computers. Interest group chairman John Massman, by his own reckoning, has spent $65K on his machine. His system unit and the adjacent Tecmar expansion chassis are full of devices, including a real-time clock, a BSR controller, a line driver, a modem, three asynchronous ports, two parallel ports, and an IEEE 488 port. Clustered around the machine are his peripherals: a monochrome monitor, a color monitor, a TDC 3000 tape drive (with 4.5M of formatted memory), and a Diablo printer (one item that belongs to the company).

To expand their systems, club members sometimes get together and buy equipment in quantity. IBM offers a 5 percent discount on sales of twenty-five units or more. (There are also volume discounts for quantities over a hundred and special discounts for educational organizations.) Recently, the group invested in some expansion boards from the Quadram Corporation. The Quadram boards were attractive to many members because each board includes 64-256K RAM, a clock/calendar, a parallel port, and a serial port. Buying together, the members could get the boards much more cheaply than buying separately.

National Organizations. There are many advantages to joining a

Where and When

Here follows a list of user groups which have formed or are forming around the country. Bear in mind that a group is often listed for a single town, but includes members from a larger area. The name given in each case is the contact person for the group—the organizer or an elected officer. The address is a mailing address, generally not the meeting address. If the information seems incomplete, it is because often dues, meeting dates, and so on have not yet been fixed. In most cases, a phone number is listed that you can call for further information.

ALABAMA

Birmingham. Chet Ellis, Computerland, 215 West Valley Avenue, Birmingham, AL 35209; 205-942-8085. Meets first Saturday; dues $20 per year; monthly newsletter.

ALASKA

Anchorage. Mark Bolzern, Computerland, 502 West Northern Lights, Anchorage, AK 99503; 907-272-1518. Call for information.

ARIZONA

Phoenix. Jim Serbin, 2500 Valley Center, Phoenix, AZ 85073; 602-997-7648. Call for information.

Tucson. Theresa Baudier, 100 North Stone Avenue, Suite 1100, Tucson, AZ 85701; 602-622-4751. Meets third Tuesday; dues $5 per year.

CALIFORNIA

Gilroy. Lee Wersel, 7255 Orchard Drive, Gilroy, CA 95020. Write for information.

Huntington Beach. Phil Root, 6242 Moonfield Drive, Huntington Beach, CA 92648; 714-847-6369. Meets last Wednesday; monthly newsletter.

Los Angeles. Neil Zachary, Box 4136, Los Angeles, CA 90028; 213-937-1314. Meets third Tuesday; dues $35 per year; monthly newsletter.

San Diego. John Field, 1384 Caliente Loop, Chula Vista, CA 92010; 714-421-9686. Interest group in San Diego Computer Society; meets third Tuesday; monthly newsletter.

San Diego, Pete Nelson, Box 80787, San Diego, CA 92138; 714-453-4953. Interest group in Cubic Computer Club; meets alternate Wednesdays.

San Fernando Valley. Al Saavedra, 4685 Morro Drive, Woodland Hills, CA 91364; 213-347-9495. Meets first Tuesday.

Silicon Valley. Nancy Nehring, 1250 Oakmead Parkway, Box 686, Sunnyvale, CA 94086; 408-984-2558. Meets second Wednesday; dues $15 per year; monthly newsletter.

COLORADO

Denver. Steve Leibson, 4040 Greenbriar Boulevard, Boulder, CO 80303; 303-494-4062. Interest group in Denver Amateur Computer Society; dues $12 per year; monthly newsletter.

DISTRICT OF COLUMBIA

Washington. Mike Todd, 1414-C Wright Circle, Bolling AFB, Washington, DC 20336; 202-361-5187. Meets third Monday; dues $15 per year; monthly newsletter; bulletin board (300 baud), 703-560-0979.

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Sarasota. Saul Lowitt, Ph.D., 2131 Brookhaven Drive, Sarasota, FL 33579; 813-921-3230. Autumn Revolution chapter; call for information.

GEORGIA

Atlanta. Randy Bullard, 2965 Atterberry Court, Decatur, GA 30033; 404-634-9585. Interest group in Atlanta Computer Society; meets second Wednesday; dues $20 per year; monthly newsletter.

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Honolulu. Doug Long, 1750 Kalakaua, Suite 3-168, Honolulu, HI 96826; 808-735-5769. Meets first Tuesday; dues $10 per year; monthly newsletter.

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Boise. Bruce Burns, Computerland, 687 South Capitol Boulevard, Boise, ID 83702; 208-344-5545. Call for information.

ILLINOIS

Chicago. James L. Szafranski, 5195 Castaway Lane, Barrington, IL 60010; 312-934-8133. Autumn Revolution chapter; call for information.

INDIANA

Fort Wayne. Susan Shields, Computerland, 5450 North Coldwater Road, Fort Wayne, IN 46825; 219-483-8107. Call for information.

Indianapolis. David Reed, 6704 Hoover Road, Indianapolis, IN 46260; 317-259-7892. Meets fourth Monday; dues $15 per year single, $20 per year family.

South Bend. Thomas R. Lafree, 19525 Cleveland Road, South Bend, IN 46637; 219-277-3344. Autumn Revolution chapter; call for information.

IOWA

Cedar Falls. Lee Ann Moore, Computerland, Black Hawk Village Shopping Center, Cedar Falls, IA 50613; 319-277-1700. Meets first Monday.

KANSAS

Topeka. Becky Hinton, Topeka Public Library, 1515 West 10th Street, Topeka, KS 66604; 913-233-2040. Meets third Monday.

LOUISIANA

New Orleans. Dante Pingenot, 3517 19th Street, Metairie, LA 70002; 504-588-4317. Meets first and third Wednesday; dues $18 per year; bimonthly newsletter.

MASSACHUSETTS

Boston. Mike Rohrbach, 38 Garden Road, Wellesley Hills, MA 02181; 617-235-8830. Interest group in Boston Computer Society; meets second Tuesday; dues $18 per year; bimonthly magazine.

user group. However, if you live in, say, Barrow, Alaska, you may find there is no group in your area. No matter where you live, though, you can belong to a national organization, of which there are three.

Perhaps the best-known organization is Autumn Revolution. It is the only one that has local chapters. (Of course, you don't have to belong to a local chapter to be a member.) The group offers a number of technical services to its members. Notably, there is a technical hotline that members can call to get an earful of information. There is also a monthly newsletter and a software library. The software library is a bit unusual because it includes no commercial programs. Instead, members send in their own software, and the group sells it for whatever the author thinks it will bring. For those who prefer hard copy, there is a reference library and a monthly newsletter. Autumn Revolution can be contacted at Box 55329, Tulsa, OK 74155; (918) 438-4582. The dues are $30 a year.

Personna, another national organization, is also bidding for memberships. Their emphasis is less on technical service than on getting discounts for members. Personna's monthly newsletter includes lists of discount hardware and software. Personna has no local chapters, but it is planning to open regional offices that will offer training and support. It has also scheduled a national convention for mid-September in Atlantic City. Personna can be contacted at Box 759, Point Pleasant, NJ 08742. Dues are $45 a year.

For those who prefer a more personal organization, there is the IBM Personal Computer Owners Group, organized by Jim and Cindy Cookinham. The IPCO newsletter emphasizes product news and evaluations. There is also a library of user-contributed software; if you send them a new program, you can pick any four off the shelf in exchange. There are no local chapters. IPCO can be contacted at Box 10426, Pittsburgh, PA 15234; (412) 561-1857. Dues are $15 a year ($20 for Canadians). ▲

MARYLAND

Luthersville. Bob Roswell or Ed Honabach, Computerland, 1516 York Road, Luthersville, MD 21093; 301-337-5555. Meets first Tuesday; dues $5 per year; monthly newsletter.

MINNESOTA

Minneapolis. Peter LeNeau, 100 North 6th Street, Minneapolis, MN 55403; 612-339-3233. Meets second Tuesday.

NEW YORK

Long Island. Jim Pretki or Richard Parker, Computerland, 79 Westbury Avenue, Carle Place, NY 11514; 516-742-2262. Interest group in Long Island Computer Users Association; call for information.

Manhattan. Helaine Head, 360 Central Park West, New York, NY 10025; 212-222-9027. Autumn Revolution chapter; call for information.

OHIO

Cincinnati. Dr. Robert Bergholz, 9529 Heather Court, Cincinnati, OH 45242; 513-243-9298. Call for information.

OREGON

Portland. Rich Rohde, 12260 S.W. 124th Street, Tigard, OR 97223; 503-620-6862. Meets second Wednesday; dues $20 per year; monthly newsletter.

PENNSYLVANIA

Philadelphia. Bennett Landsman, 2041 Harbour Drive, Palmyra, NJ 08065; 609-786-1441. Interest group in Philadelphia Area Computer Society; meets third Saturday; dues $20 per year; monthly newsletter.

Pittsburgh. Ron Kester, 1018 Greenlawn Drive, Pittsburgh, PA 15216; 412-341-2898 (home), 412-273-7679 (work). Call for information.

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Knoxville. Ross Burrus, Science Applications, Inc., Plaza Tower, Suite 801, Oak Ridge, TN 37830; 615-482-6649. Meets second Tuesday; monthly newsletter.

TEXAS

Dallas-Fort Worth. Samuel P. Cook, 309 Lincolnshire, Irving, TX 75061; 214-253-6979. Meets third Saturday; dues $30 per year; monthly newsletter.

Houston. Rob Taylor, 8023 Shady Grove, Houston, TX 77040; 713-937-3592. Meets second Tuesday; dues $25 per year; monthly newsletter.

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Salt Lake City. Debby Williamson, Computerland, 161 East 200 South, Salt Lake City, UT 84111; 801-364-4416. Autumn Revolution chapter; call for information.

VIRGINIA

Richmond. Bob Minteer, Box 24685, Richmond, VA 23224; 804-794-3954 (home), 804-274-5661 (office). Call for information.

WASHINGTON

Bellevue. The PNW IBM Users Group, Box 3363, Bellevue, WA 98009. Write for information.

Spokane. Maurice Feryn, Route 1, Box 394, Mead, WA 99021; 509-466-3685. Call for information. ▲

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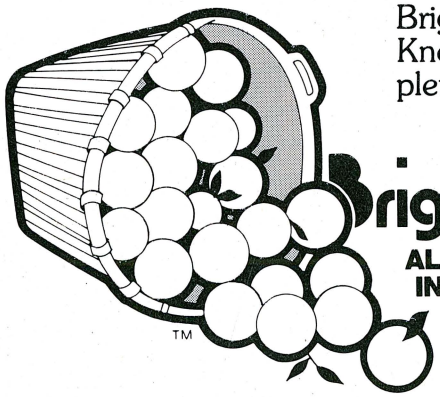

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Exec Digital Research

from page 6

based on providing good service. Rowley did not grow up as though destined for top management in a technology company. His interests were sports rather than academics in high school and he followed the prelaw path when he matriculated to college.

It was a course in logic that brought Rowley around. He recognized that the principles that governed symbolic logic likewise governed mathematics. His appetite whetted, he switched majors to physics and proceeded to gulp down higher mathematics and physics courses in doses that would have caused the Surgeon General's eyebrows to rise. After graduation, he spent two years writing applications software for Computer Sciences Corporation before joining Tektronix and entering management.

Looking Around. What attracted Rowley away from Intel to Digital Research is a giant market for systems software and a company positioned to capitalize on that growth. Rowley cites studies indicating a multi-billion-dollar market for operating system software in the next few years and believes that systems with the portability to encompass large segments of the market will be the ones that will capture the lion's share of that revenue.

That belief stems from his conviction that most applications programs will now be written in high-level languages to make them portable. He sees the days of the assembly language programmer as numbered because of the difficulty of moving those programs to other systems. Likewise, he believes that companies that persist in developing proprietary operating systems will lose market shares as end users recognize the lost opportunity to use existing libraries of software entailed in the purchase of those computers.

This view augurs well for companies like Digital Research with a portable operating system.

Rowley believes in the necessity of standardizing graphics conventions inside the operating systems and was a motive force in the addition of the graphics module to the research and development schedule. All sixteen-bit microcomputer manufacturers will be developing superb graphics, but Rowley believes the OEMs and ISVs are better served by including a standardized graphics package as a part of the operating system.

There have been no dramatic changes at Digital Research during Rowley's tenure, although he did upgrade the shipping and receiving department to the status of manufacturing and was instrumental in the decision for the company to provide IBM with a product completely finished, including documentation and packaging. Digital Research is one of only two companies shipping complete product to IBM.

Motivation for providing that service was to gain the company experience in the total manufacture and shipping of polished product.

Rowley will have to be mighty nimble to keep atop Digital's growth, but his Intel experience should have provided him with practical experience in harnessing resources in an explosive growth situation. Among the lessons he learned was to avoid the establishment of divisions, which tend to become bureaucratic, monolithic, power-hungry, and self-perpetuating. He prefers instead to form strategic business centers, the properties of which he describes as being quick to react to circumstances, divisible, small, and marketshare oriented rather than bottomline oriented.

If Rowley's perceptions of the systems software market are accurate, that implies a gross or two of these strategic business centers in the next few years.

Full Circle. By the way, remember Dorothy McEwen? She of the founding family? She of the business expertise? She with the correct pricing policy? She's also married to Gary Kildall, with whom she shares two children. By adopting her maiden name, she prevented, during those formative years, anyone from applying the stigma of a "mom and pop store" to their company. ▲

The First Original 33 Across Puzzle

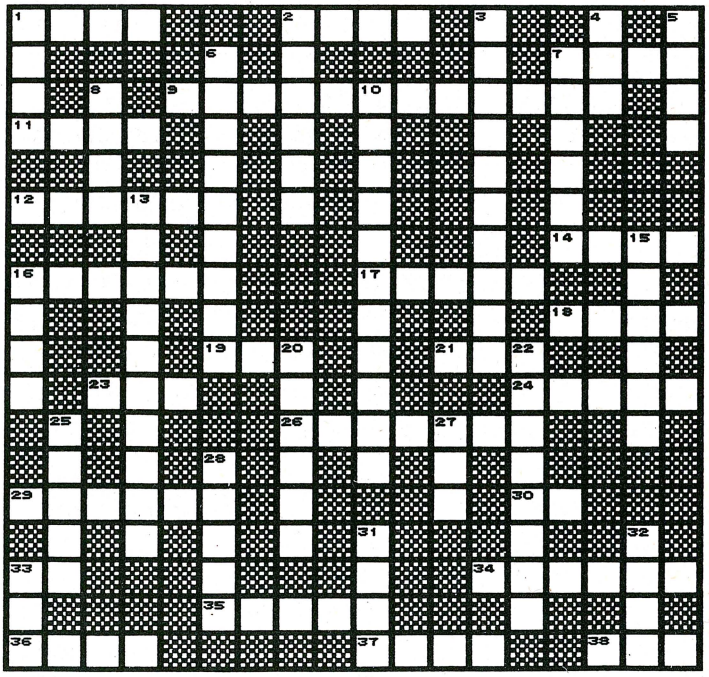
Across

1. I always wanted to . . . cheerleader.
2. Military recruit.
7. Not original.
9. Out of step.
11. Goes with fish.
12. Rhymes with "missed 'em."
14. First of the three Rs.
16. French philosopher.
17. Puts you in the driver's seat.
18. Speed-read.
19. Lamb's dad.
21. See our tea.
23. Goes with number 11.
24. I wish I hadn't done that.
26. Civil War vessel.
29. Houdini's trick.
30. Freezing cold.
33. What it's all about.
34. Shift into reverse.
35. More fun than *VisiCalc*.
36. No graphics.
37. Scotch plastic.
38. Control program number 26.

Down

1. Radio jockey's plastic.
2. Second base.
3. Better known for rifle.
4. Number one down operating system.
5. A dollar, maybe.
6. Puts it all together.
7. Swears a lot.
8. Life.
10. Conventional greeting.
13. Man behind the machine.
15. Sci-fi mag.
16. High school dance.
20. Thanks for the . . .
22. Fatal.
25. Elementary.
27. Coke without calories.
28. Exterminator's job.
31. Piece of fence.
32. Where gigo goes.
33. Sometimes out, sometimes in.

fj



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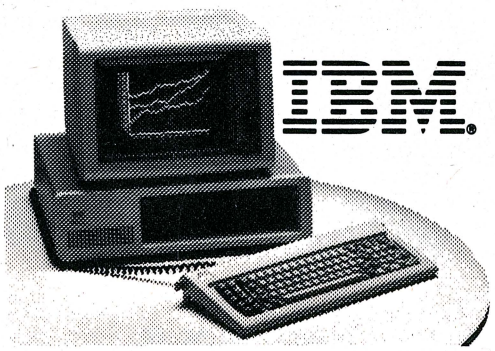

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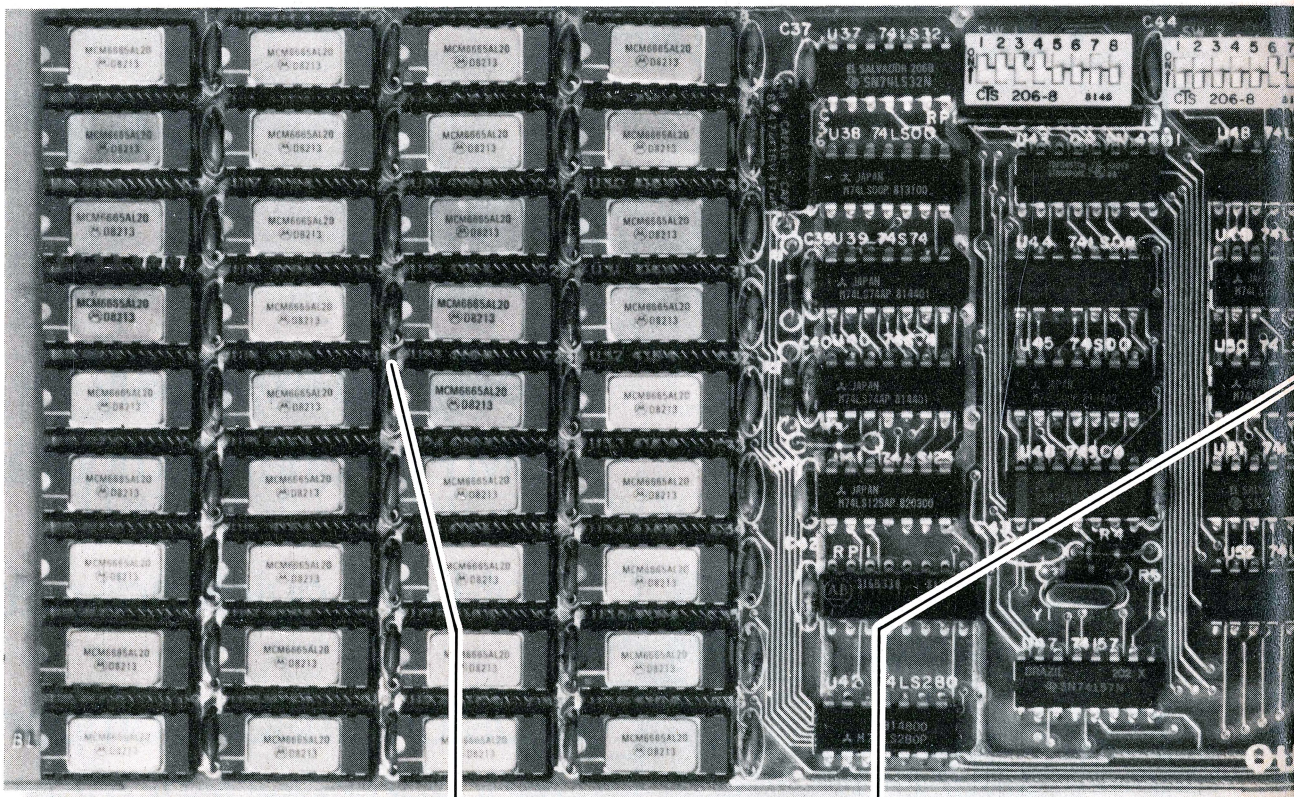

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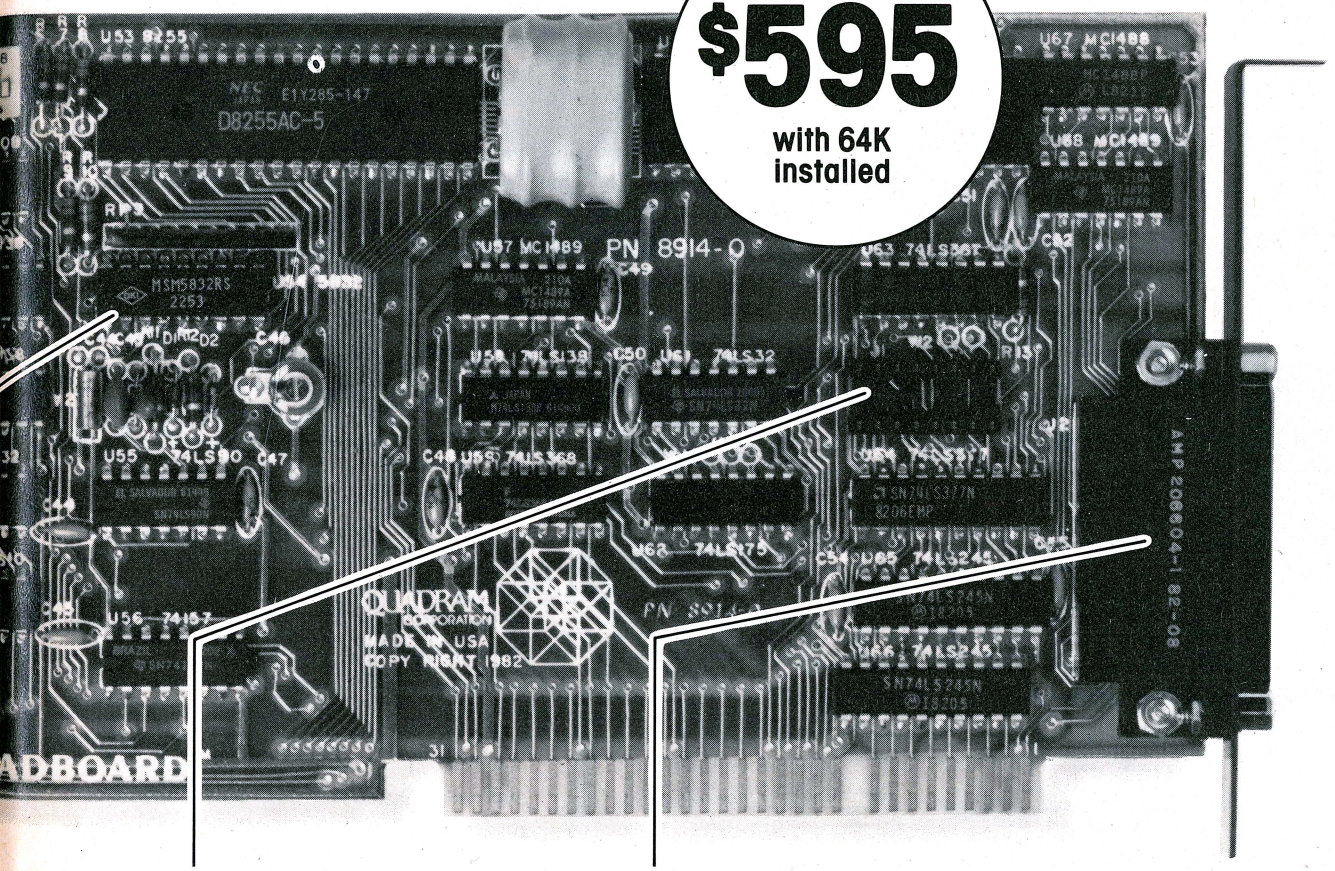

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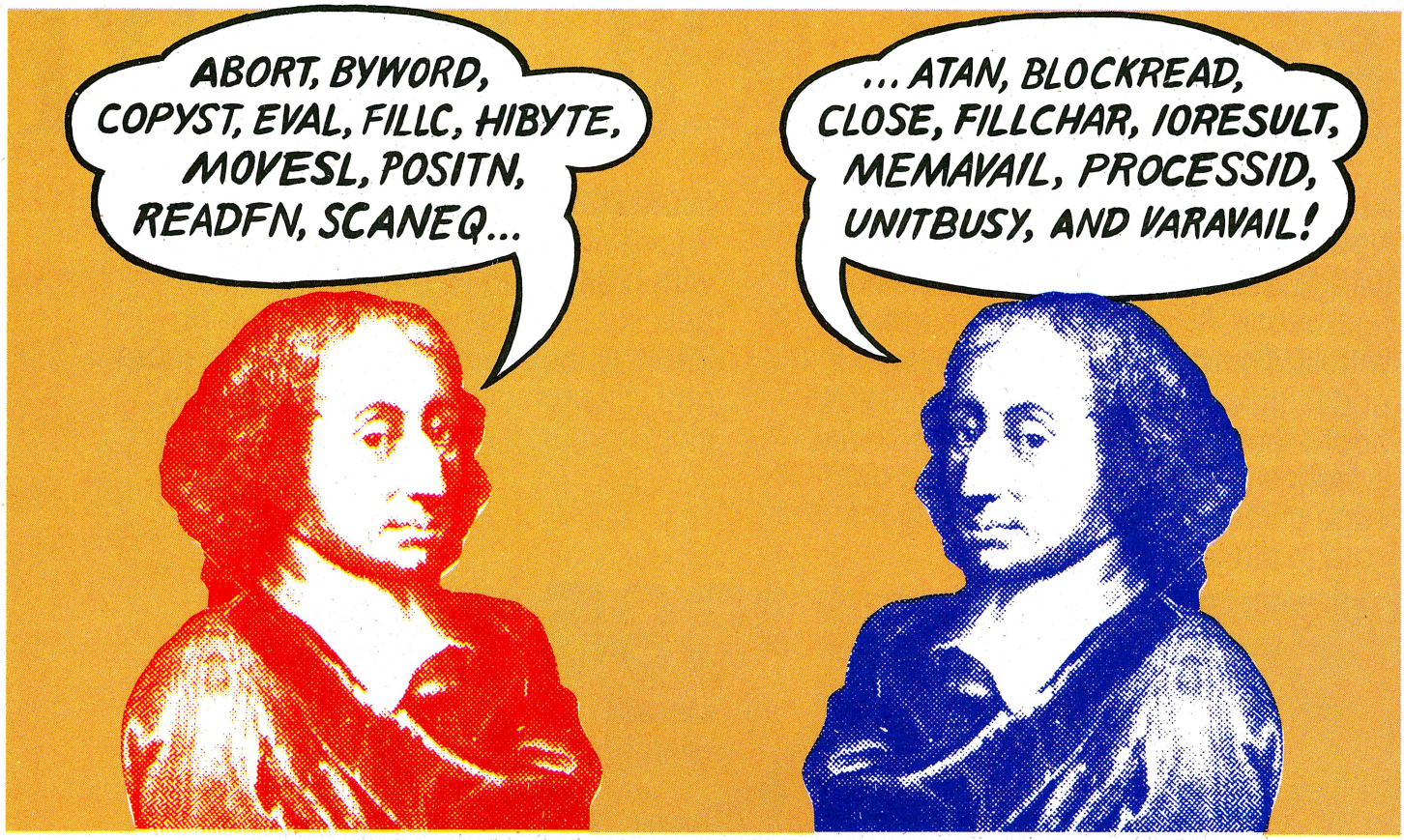
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IBM Pascal vs. p-System

The First of Two Articles

by Bruce F. Webster and Deirdre A. Wendt

Pascal is replacing Basic as the standard development language for microcomputers, according to a recent article in *Electronic Design* (March 18, 1982) that surveyed opinion about microcomputer operating systems.

The article cites two factors in support of that conclusion. First, Pascal is the only language offered as standard on more operating systems than it was a year earlier. Basic, in contrast, lost ground. Second, more than two-thirds of the operating systems released during the year of the survey offer Pascal, while only one-third come with Basic.

It is not surprising, then, that IBM chose to offer not one but two versions of Pascal for the Personal Computer. IBM first released IBM Pascal, developed by Microsoft to run under PC-DOS. A few months later, they released the UCSD p-System operating system, developed by SofTech, along with UCSD Pascal and Fortran-77.

Though the choice is nice, it raises some questions. Specifically, software developers using the pc need to be able to answer the following: Should I use Pascal? What's the difference between IBM Pascal and UCSD? Which one should I use?

Overview. IBM Pascal was developed by Microsoft, the same folk who developed PC-DOS. The package comprises three disks and one reference manual. The disks contain the first-pass compiler, the second-pass compiler, and the linker and system library. Each one of these items is too big to fit on a disk with either of the other two; hence, three disks. The compiler's stated purpose is to produce efficient, optimized 8086 machine code, and the different language extensions are aimed at allowing systems programming without resorting to assembly language. The Pascal reference manual is an item-by-item discussion of the different language features and is aimed at the fairly experienced user.

The UCSD p-System was developed a few years ago at the University of California's San Diego campus by a group led by Dr. Kenneth Bowles. When legal issues arose over profits from sales of the system, SofTech Microsystems was given sole distribution rights. SofTech has continued to

develop the p-System; the IBM release is version 4.0. The p-System is actually an entire operating system, with a screen-oriented editor, file manager, and other utilities. The package contains six disks and five volumes of documentation.

The disks include two versions of the p-System and UCSD Pascal compiler (one version is for single-precision real numbers, the other for double precision), an 8086 assembler, a native code generator, two disks full of utility programs, and a special disk designed to teach beginners how to use the p-System. The manuals provided include a beginner's guide to the p-System, a p-System user's guide, a UCSD Pascal reference manual, a UCSD Pascal programmer's manual, an 8086-assembler reference manual, and a p-System internal architecture manual.

One unique feature of the p-System and Pascal compiler is that programs are not compiled into 8086 machine code; instead, they compile into a highly compact pseudo machine code, or *p-code*. In fact, almost the entire operating system is in p-code. The major exception is the p-code interpreter, written in 8086 machine code, which executes the p-code images. Because the p-code is interpreted, programs do not run as fast as they would if they were in machine code; on the other hand, they take up a lot less space. If greater speed is required, the native code generator will translate portions of a p-code file into 8086 machine code, and Pascal-callable assembly language routines can be written with the 8086 assembler.

Language Features. The Pascal bible is the *Pascal Users Manual and Report* (second edition) by Jensen and Wirth. This slim volume has long been used as the definition of standard Pascal. More recently, the International Standards Organization (ISO) has released a standard Pascal definition along with a set of programs that any compiler claiming to meet the ISO standard must compile and run correctly. However, most Pascal compilers go beyond the ISO or Jensen and Wirth standards. They contain various enhancements and additions.

No one is quite satisfied with standard Pascal. It is a fairly "small" language. For example, string handling in standard Pascal is clumsy and tedious, so most Pascal compilers add some sort of special string handling. The result is that most Pascals define themselves by what they have above and beyond standard Pascal.

IBM Pascal and UCSD Pascal are no exceptions. Both have numerous enhancements and extensions to standard Pascal. Here we'll focus on these additions, showing how IBM Pascal and UCSD Pascal differ from standard Pascal—and from each other. For simplicity, we'll abbreviate IBM Pascal and UCSD Pascal as *IBM* and *UCSD*, respectively.

Identifiers. Identifiers are the names of constants, data types, variables, procedures, and functions. The standard definition is that an identifier must begin with a letter, followed by additional letters and/or numerals. Both IBM and UCSD allow the underscore character "_" as well, in order to increase legibility ("read_rec" instead of "readrec"); however, the underline is significant in IBM ("read_rec" is different from "readrec"), while it's not significant in UCSD ("read_rec" and "readrec" are the same). An identifier may be of "any length" (though the practical limit is that it must fit on one line), but UCSD only recognizes the first eight characters, while IBM recognizes the first thirty-one.

Constants. Pascal allows you to declare identifiers as having constant values, so that any attempt to change the value of the identifier results in an error. For example:

```
CONST
  pi = 3.1415926 ;
```

UCSD allows a constant to be integer, real, character, string, Boolean, and the opposite value of a previously defined numeric constant (such as minus_pi = −pi ;). IBM gives you significantly more latitude. Constant expressions include a number of operations and functions (for example, bell = chr (7);). Furthermore, constants can be declared intermixed with type declarations, allowing *structured constants*—constants based on user-defined data types. For example:

```
TYPE
  months     = (jan,feb,mar,apr,
               may,jun,jul,aug,
               sep,oct,nov,dec);
  charset    = SET OF
               [' '..'~'];
  date       =
    RECORD
      year:    0..3000;
      month:   months;
      day:     1..31
    END;
CONST
  uppercase  = charset
               ['A'..'Z'];
  lowercase  = charset
               ['a'..'z'];
  numerals   = charset
               ['0'..'9'];
  d_day      = date(1944,jun,6);
```

and so on.

Predefined Data Types. Pascal automat-

ically assumes the existence of certain data types. These include *integer, real, char* (character), and *Boolean.* UCSD defines integer to be −32767..32767 and adds the type *long integer*, which allows the user to define variables of up to thirty-six decimal digits. The UCSD real type is either single (seven-digit precision, exponent range of 10E−38 to 10E+38) or double (sixteen-digit precision, exponent range of 10E−308 to 10E+308) precision. Character strings (*string[n]*, n=1 to 255) are also available in UCSD, along with a full set of functions for them. Indeed, the UCSD string definition is becoming something of an industry standard.

IBM default data types include the standard integer, real, char, and Boolean. Integer has the same range as in UCSD, and the type *word* (0..65535) has been added. In addition, integer constants can be expressed in different bases, using the form [base]# [value]. For example, 16#FF = 10#255 = 8#177777 = 2#11111111. The IBM real type is the same as the UCSD single-precision real. IBM has two (count 'em) character string types; *string[n]* (n = 1..32767), and *lstring[m]* (m=0..255). Of the two, lstring more closely resembles the UCSD string type; that is, the length of the string can be easily retrieved, and special functions are available.

Both IBM and UCSD Pascal offer the predefined data structures *array, record,* and *set.* UCSD size limitations are 32,766 bytes for arrays and 4,080 elements for sets; size limits for records are not specified. *Packed* data structures are actually packed—crammed into as little space as possible.

IBM also limits arrays to 32,766 bytes, but no information about set and record limits is given. Packed data structures are not packed. IBM also has a *super array* structure.

User-Defined Data Types. One of Pascal's most powerful features is the ability it gives you to define your own data types and structures. Both IBM and UCSD include enumerated data types, subranges, variant records (although IBM gives many warnings concerning their implementation), pointers, and structures built out of arrays, records, and sets. IBM goes a step farther and allows you a general array type (called a super array) with indeterminate upper boundaries. For example:

```
TYPE

vector      = SUPER ARRAY
              [1..*] OF real;
matrix      = SUPER ARRAY
              [1..*,1..*] OF real;
square      = matrix (5,5);

VAR
position:     vector(3);
magic:        square;
correlation:  matrix(3,20);
```

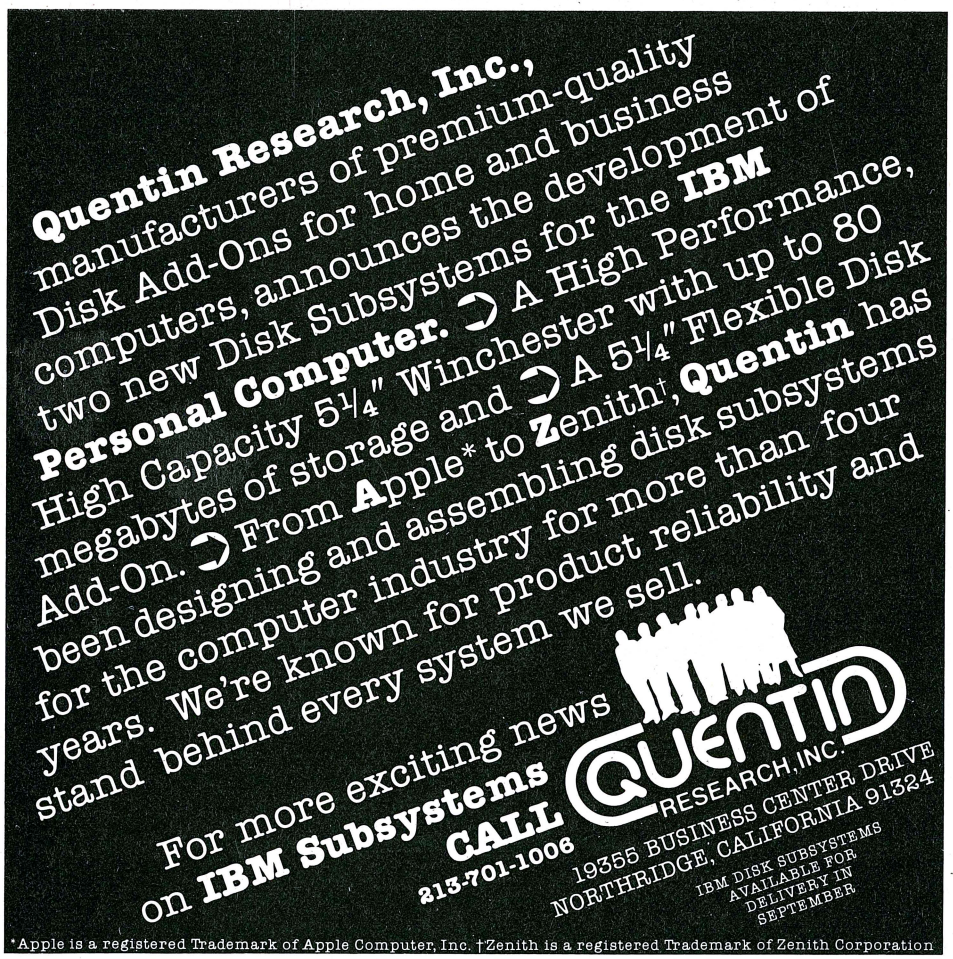
IBM provides the functions *lower* and *upper*, which let you determine what the lower and upper bounds of a super array-based variable are. For example, *lower(position)* = 1 and *upper(position)* = 3.

Variables. Pascal requires that all variables be explicitly declared. In other words, you can't use a variable unless its name and type have been stated in a *var* section. Both IBM and UCSD adhere to this requirement. IBM also offers a number of extensions. Variables can be declared as being *static* (fixed memory address), *public* (available to other modules), *extern* (declared in other modules), and *readonly* (can't be modified in that module). IBM also supports a *value* section following a var section to allow the programmer to assign initial values to variables.

Expressions, Statements, and Control Structures. Wirth designed Pascal to allow clear and simple implementation of algorithms. One of the earliest proponents of *goto*less programming, Wirth combined five different control structures—*if..then..else, for, repeat..until, while..do,* and *case*—along with compound statements (allowing any statement to be replaced by a group of statements) to help eliminate the need for *goto* commands. However, Wirth did include a limited *goto* statement and numeric labels in the standard Pascal definition.

UCSD follows standard Pascal with just a few exceptions. *Goto* statements can jump only to a label within the same block. If the expression in a *case* statement doesn't match one of the choices listed, control falls through. Also, the *exit* statement allows immediate termination of a procedure or the program itself at any point, eliminating another need for *goto* statements.

IBM has a number of extensions, mostly dealing with *goto* statements. IBM supports both numeric and alphanumeric labels (the latter following the rules for identifiers). Two statements—*break* and *cycle*—are designed for use with repetitive statements (*repeat, while, for*). The *break* statement causes an immediate exit from the loop, while *cycle* starts the next iteration. These statements can be used with or without labels; if labels are not used, the innermost loop containing the statement is assumed. The *return* statement, analogous to UCSD's *exit*, allows an immediate exit from a procedure. IBM's *case* statement allows the *otherwise* clause; in fact, if it is not used, an error results if the value doesn't correspond to one of the choices listed.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Procedures and Functions. Standard Pascal allows the user to define two types of subroutines: procedures and functions. A procedure is called by using its name in a statement; a function, in the right-hand side of an expression. Both can accept lists of parameters, which can be of any data type or can be themselves the names of procedures or functions. These parameters can be passed as variables or simply as values. A function can return values of type integer, real, char, Boolean, or any enumerated data type. No provision is made for separate compilation of subroutines.

UCSD supports the standard definition, with one exception: procedure and function names cannot be passed as parameters. Separate compilation is supported through *units*, which are library packages of subroutines and data definitions. Assembly language routines can also be declared in a program and assembled separately. Finally, UCSD allows *processes*, which are subroutines that can be executed concurrent with other portions of the calling program (more about this in part 2 of this article).

IBM supports the standard definition, including the passing of subroutine names. Various procedure attributes, such as *extern, pure* (functions only), and *public*, can be used. Two routes are available for separate compilation: *units* (like UCSD) and "modules" (simple collections of subroutines).

Predeclared Procedures and Functions. The definition of standard Pascal includes a number of functions and procedures automatically declared and available. These include:

abs
arctan
chr
cos
dispose
eof
eoln
exp
float
get
ln
new
odd
ord
pack
page
pred
put
read
readln
reset
rewrite
round
sin
sqr
sqrt
succ
trunc
unpack
write
writeln

UCSD adds a number of other predeclared routines. These include:

atan
attach
blockread
blockwrite
close
concat
copy
delete
exit
fillchar
gotoxy
halt
idsearch
insert
ioresult
length
log
mark
memavail
memlock
memswap
moveleft
moveright
pos
processid
pwroften
release
scan
seek
semaphore
seminit
signal
sizeof
start
str
time
treesearch
unitbusy
unitclear
unitread
unitstatus
unitwait
unitwrite
varavail
vardispose
varnew
wait

IBM also has a number of extensions to the standard predeclared functions and procedures. These include:

abort
assign
byword
concat
copylst
copystr
decode
delete
discard
encode
eval
fillc
fillsc
hibyte
insert
lobyte
lower
movel
mover
movesl
movesr
positn
readfn
readset
result
retype
scaneq
scanne
sizeof
upper

If any of these procedures and functions pique your interest, head to your local computer store and take a look through the documentation. Better yet, ask someone who uses the appropriate Pascal.

Conclusions. Although UCSD Pascal has more predeclared functions, IBM Pascal has more features overall, many of which are oriented toward systems programming. Microsoft has put a strong effort—perhaps too strong—into making its Pascal a very powerful language; it may have too many features. Many of the advanced features are not clearly documented and do not behave as expected. By comparison, UCSD programs were very predictable and very easy to implement. Some of the problems with IBM may be due to a compiler that's trying to do too many things.

Next month we'll concentrate on system level features of both languages. We'll talk about documentation and ease of use and give a few benchmarks, as well as discussing some of the bugs found in both systems. ▲

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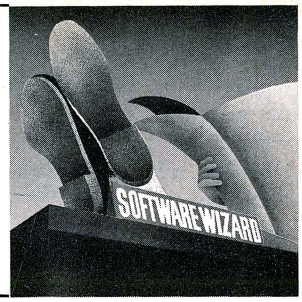

Δ **The Avalon Hill Game Company** (Baltimore, MD), in conjunction with *Sports Illustrated*, is expanding its line of computer games to include the IBM pc. The two companies now have nineteen games running on TRS-80s, Apples, Pets, and Ataris. They expect to introduce a dozen more this summer and plan to translate the majority of the catalog to run on the pc.

Δ **Digital Research** (Pacific Grove, CA) and **Graphics Software Systems** (Wilsonville, OR) have announced an agreement to collaborate on the development of device-independent graphics software primitives consistent with computer graphics standards being developed by the X3H3 committee of the American National Standards Institute. Initial efforts will be aimed at producing software for original equipment manufacturers. Libraries for compilers will be developed using Graphics Software Systems's primitives in conjunction with Digital Research's computer languages.

Δ **George V. Grune** has assumed the position of chief executive officer of **Source Telecomputing Corporation** (McLean, VA), replacing **Graeme Keeping,** who has resigned for personal reasons. Grune is a vice president and director of Source's parent company, the Reader's Digest Association.

Δ **Leading Edge Products** (Canton, MA) has hired **John E. Fisher** as manager of technical support. Fisher was formerly product support and program manager in the field engineering division of Honeywell Information Systems. Leading Edge is the exclusive distributor of Elephant Memory Systems and C. Itoh printers.

Greg Tibbetts: Microsoft executive moving to Lobo Drives International.

Δ**Greg Tibbetts** is leaving **Microsoft** (Bellevue, WA) to become vice president for software development at **Lobo Drives International** (Goleta, CA). Tibbetts was manager of product support for Microsoft. ▲

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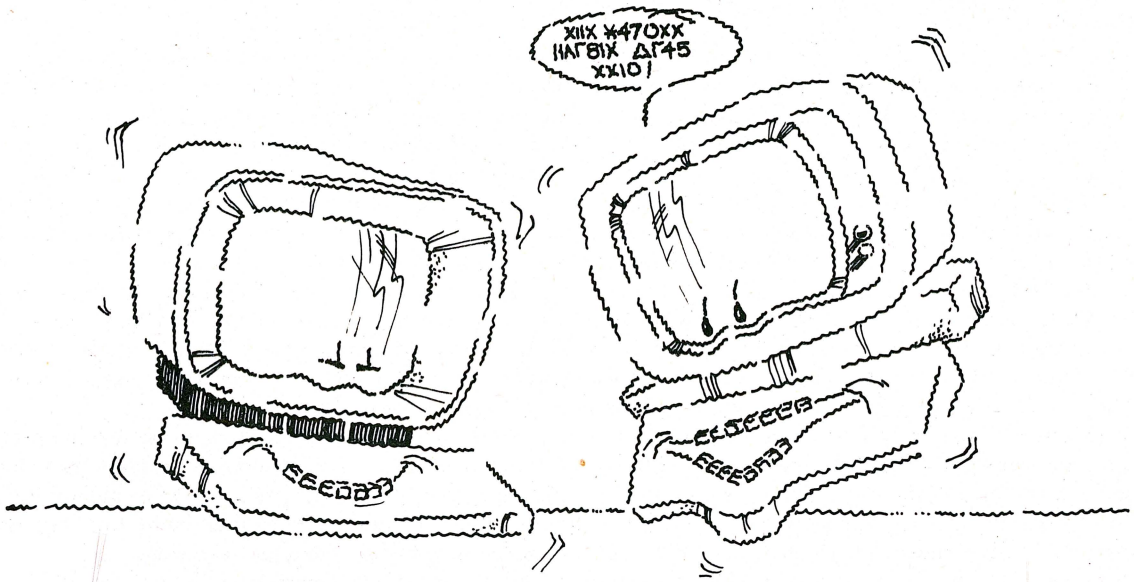

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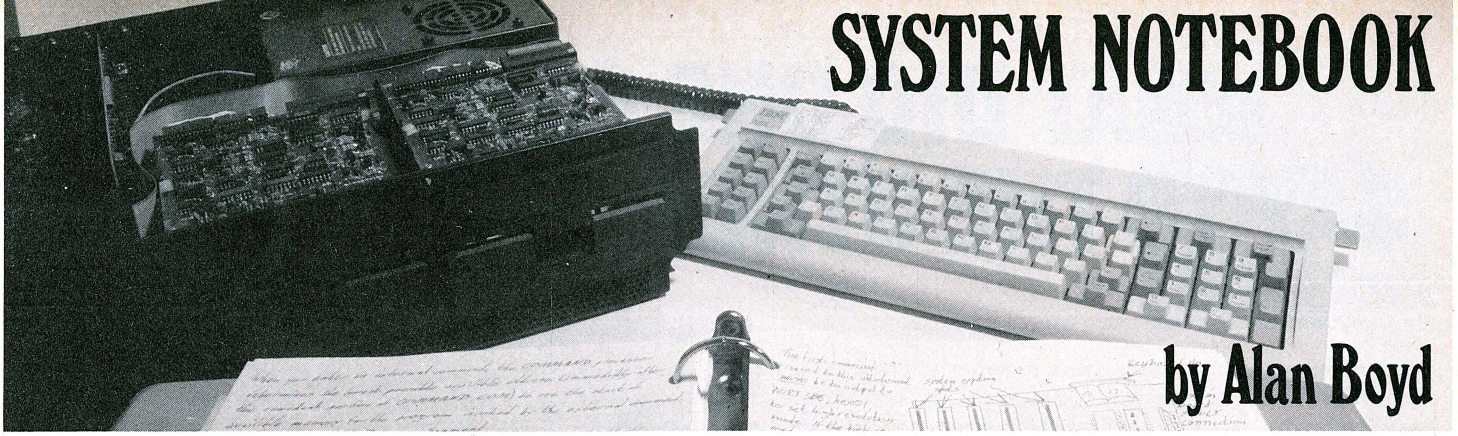

SYSTEM NOTEBOOK

by Alan Boyd

Was ist DOS?

The *IBM Disk Operating System* manual offers a simple explanation of what the disk operating system is and does. Before working with DOS, it's essential that you read at least the introduction to that manual.

The DOS manual is, however, primarily a reference. Even though the IBM documentation is being hailed as the best yet to surface for a personal or small business computer, it's still noticeably short on tutorial matter. Nor does it offer much detail on what happens inside the computer when you issue a DOS command; it doesn't give a clear picture of what DOS "looks like" internally.

In this month's column we'll attempt to fill in some details about DOS that the IBM documentation appears to take for granted. This will get us through the basics, from booting the system to creating disks. Because many people may, justifiably, feel they already know how to perform these basic operations, the subjects will be made more interesting by inclusion of some lesser-known facts about the operating system, particularly the differences between DOS and some older operating systems. Since DOS is superficially similar to some of these older systems, many users may assume that DOS is no more capable than these. As you'll see, DOS may look familiar on the outside, but it has some surprises within.

Starting DOS. The process of starting the operating system, by placing the DOS disk in drive A and turning the computer on, is generally called *booting the system.* This term comes from the metaphor of picking oneself up by the bootstraps. What this expression means in the context of the computer is that the operating system is able to start itself from a minimal amount of information.

The information required to boot DOS is stored on one of the read-only memory (ROM) chips inside the computer. This information, called the *bootstrap loader,* is a short program that starts the disk drive running by turning the motor on and then knows exactly where on disk to find a slightly longer program. This longer program is then read into user memory (RAM). Its function is, predictably, to read yet a longer program off the disk. The net result is that the bulk of the operating system is read into memory from disk whenever the computer is started. This entire process takes only a few seconds. The long delay that precedes the loading of the operating system is caused by the pc's diagnostic program, which checks out the hardware whenever the machine is turned on.

DOS consists of several definable parts, some of which can be customized by the user for a particular application. The first of these parts is called the *boot record.* This is the short program that the bootstrap loader loads, and it is this program that's responsible for loading the rest of DOS into memory. On some disks, called *nonsystem disks,* the boot record is replaced with an error message. This is the message you'll see if you try to start the system with a non-DOS disk. We'll examine the boot record in more detail when we discuss the formatting procedure and the DOS format command.

The rest of DOS, apart from the boot record, is stored on disk in two parts. The first part is the program that interfaces the operating system with the programs stored in the system ROM; it's called the *BIOS Interface.* The second part is the main body of the operating system. After the *BIOS Interface* and main body of DOS are loaded, one additional program, called the *Command Processor,* is read into memory, and then the system is ready for use.

Once DOS is placed in memory by the boot operation, it is available for use by either an operator, who types commands at the keyboard, or by a program that makes system "calls." Most people using DOS will only be aware of the system when they type in commands to perform system-related functions, such as formatting blank disks or invoking other programs. In this mode of operation, you're interacting with the *Command Processor,* and all other parts of the system are invisible.

When you issue a command to invoke another program, such as *Advanced Basic,* for all intents and purposes it seems that the operating system has gone away; but, in fact, the bulk of the system is still resident. It has simply slipped into the background and is called by BasicA when its functions are required.

Files. One of the primary functions of DOS, or any other operating system, is to handle all the mundane tasks associated with file manipulation. So to grasp the power of DOS, it's necessary to have some understanding of files.

DOS stores all the information it's given in files on the disk. Files can contain either data or programs. DOS itself is stored in files on disk, as are Basic, Advanced Basic, and the demonstration programs that come on the DOS master disk.

When you create a file, you give the file a name, and DOS then manipulates the file by that name. There are specific rules for naming DOS files, as well as conventions that should be obeyed.

The full name for a disk file, called its *file specification,* consists of three parts: the drive designation, the file name, and the extension. These three elements are used in this format:

d:filename.ext

where *d* is the drive designation, *filename* is the name you give the file, and *ext* is the file's extension.

The *drive designation* is a single character used to tell DOS which disk drive to use to locate the file. If your system has a single drive, then it isn't necessary to enter the drive designation or the colon.

Disk drives are named in alphabetic order; for example, the first drive is called *A,* the next one *B,* then *C,* and so on. The colon is always used as part of the drive designation.

When you first enter DOS, you will be logged onto drive A. Typing another letter and a colon will then log you onto that requested drive. If you want access to a file on the drive onto which you're currently logged, then it isn't necessary to supply the drive designation. If you want access to a file on a different disk drive and you don't want to change the logged drive, then you must include the drive designation as part of the file specification.

The filename consists of one to eight characters. The characters that can be included in the filename are all of the alphabetic charac-

ters, the numeric characters, and many of the punctuation symbols. (For a complete list of the legal punctuation symbols, consult page 2-8 of the DOS manual.) Because the period is used to separate the filename from the extension, it cannot be used as part of the filename. Neither can the colon, since it's part of the drive designation. For similar reasons, as we'll see later, neither the question mark nor the asterisk may be used in a filename.

When you're creating a filename, it's a good idea to use all eight available character positions. DOS will fill the name out with blanks if you don't use all eight. The extension is a block of one to three characters that's generally used to indicate what form the file contents take. DOS adds its own extensions to certain types of files if they're not defined by the user. For example, a file containing a program in Basic will be given the extension .bas. The following extensions have specific meanings to DOS:

.BAK	DOS-created backup file
.BAS	Basic program file
.BAT	Batch processing file
.COM	External command file
.EXE	Executable command file
.HEX	Special file for use with Debug
.MAP	Special listing file used with Link
.OBJ	Object code file from Compiler
.REL	Object code file from Assembler
.TMP	Temporary file created by DOS

Other file extensions can be created and used arbitrarily. For example, many word processing programs use the extension .txt to indicate that the file is a text file. Similarly, the extension .ndx could be used to indicate that the file contains an index, .dbf might indicate a database file, and .rep might indicate a report. In a situation where more than one person is using a single disk, the file extensions could be the initials of each user.

One interesting feature of DOS is its ability to understand so-called *wild cards* in file specifications. The wild cards are the two characters mentioned earlier—the question mark and asterisk. The question mark is a single-character wild card; it will replace any one character in a file specification. For example, if you wanted to delete the two files file1.txt and file2.txt by means of the erase command, then rather than typing

```
ERASE FILE1.TXT
ERASE FILE2.TXT
```

you could issue the single command

```
ERASE FILE?.TXT
```

and DOS would delete both files. The question mark may be used anywhere in the filename or extension and can be used repeatedly. However, rather than using it repeatedly to describe whole names, you may use the other wild card, the asterisk.

The asterisk stands for *all.* For example, if you want to kill all files with the extension .bad, you may do that by typing

```
ERASE *.BAD
```

Similarly, if you've been using a program that generates many files with the same filename but with different extensions, and you want to erase all these files, you may use the asterisk in place of the extension. Suppose, for example, you have a program that generates the files data.one, data.two, and data.thr. To erase all three files at once, the command

```
ERASE DATA. *
```

may be used. Of course, if you also have files named data.for and data.fiv on the same disk, and you don't want to erase them, then the wild card would be inappropriate. If, for whatever reason, you want to get rid of all the files on a disk, you can accomplish that by typing

```
ERASE * *
```

Because that's a particularly drastic maneuver, DOS will stop and ask if you're sure that's what you want to do. Some thought should go into the naming scheme you use for files so you can take advantage of wild cards.

DOS keeps track of all the files on each disk by maintaining a directory on a special part of the disk. You can display the directory by typing *dir.* Along with the file names, the *dir* command instructs DOS to display the size of the file in bytes (characters) and the date the file was created. Wild cards can be used with the *dir* command to yield a selective directory listing. If, for example, you only want a list of the files with extension .com, you can get it by typing

```
DIR *.COM
```

This will cause a listing of all the .com files to be displayed on the screen. The command

```
DIR *.BAS
```

will generate a list of all Basic programs on the disk. Selective listings like these can be particularly useful when you have a lot of files on disk and the full directory is too big to fit on a single screen.

DOS Commands. The examples just given show the use of two DOS commands—*erase* and *dir.* You can type either of these at the keyboard, and DOS will respond appropriately. Both are examples of the use of DOS in the *immediate mode;* immediate commands are those that can be keyed into the pc whenever the DOS prompt>_is visible.

There are two types of DOS commands—*internal* and *external.* The internal commands, which include *erase* and *dir,* are a built-in part of DOS and are loaded into memory whenever DOS is loaded; the external ones are loaded into memory from disk each time they're invoked.

External commands are stored on the DOS master disk in the form of .com files. To invoke an external command you type the name of the command following the DOS prompt. For example, the DOS command to change the internal time is *time,* and you enter it after the prompt as

```
A>TIME
```

Note that there is no need to type the extension, .com. DOS will read the information from the file time.com and prompt for the time to be entered at the keyboard. Once this is done, the internal time will be updated and DOS will issue another prompt and await another command. Of the seventeen commands supplied with DOS, nine are external and eight are internal. The internal commands are

(Batch)	COPY	DIR	ERASE
PAUSE	REM	RENAME	TYPE

The external ones are

CHKDSK	COMP	DATE
DISKCOMP	DISKCOPY	FORMAT
MODE	SYS	TIME

Other than the fact that DOS must first read external commands from disk, there are no differences between the two command types. The obvious advantage of having the external command system is that a competent user can add external DOS commands simply by writing them with the Macro Assembler or any of the native language compilers of the pc, and then storing them in .com files on a DOS disk. In fact, that is exactly how the languages and many of the applications programs are stored. For example, to invoke Advanced Basic, you type *BasicA* at the keyboard. DOS then looks for an external command called BasicA.com on the disk; if it finds it, it loads and executes the command. The result is that you're placed in Advanced Basic. We'll examine this process in greater detail in a future installment of this column. For now, a good understanding of the supplied internal and external DOS commands will suffice.

Format. This is the first DOS command you should learn, since it's both the most creative and potentially the most destructive of all the DOS commands. *Format* is an external command stored on the master disk in the file format.com. It is used to format blank, virgin disks for use with DOS. When new disks are purchased, they're usually unformatted. That is, the surface of the disk is free from any magnetic marking. DOS, however, requires that certain marks be placed on a disk so that it can find its way around the surface. This process is called formatting or initializing the disk. When DOS formats a disk, it breaks the surface into forty concentric tracks. Each track is subdivided into eight sectors of equal size. These sectors are capable of holding up to 512 bytes of information. Consequently, the total storage capacity of a single-sided disk is 40 x 8 x 512, or 163,840 bytes—about the equivalent of thirty typed pages of information.

Some of the disk space is required by DOS to store the directory and certain other information about the files on disk. More space is required if the operating system itself is to be placed on the disk. By placing the operating system on the disk, you make the disk a *master* DOS disk. A master disk is one with which you can boot the operating system—just by turning the computer on with the master in drive A.

Some users prefer that all their disks be masters, but this isn't really necessary. In fact, since master disks have considerably less space available for data storage than nonmaster disks, it's better to have DOS reside only on those disks that will be used when you first turn on the computer.

The forty concentric tracks on a disk are numbered 0 to 39; the eight sectors on each track are numbered 1 to 8. The reason the track numbering system starts at zero instead of one is that DOS uses the first track largely to maintain the disk directory tables. Track 0 sector 1 is used to store the *boot record.* This boot record for a master disk is different from that for a nonmaster, or slave, disk. On a master disk, the boot record contains the code necessary to read the rest of DOS into memory during the boot process. On a slave disk, the boot record contains the error message that appears whenever you attempt to boot the system with a nonmaster disk.

Track 0 sector 2 contains a table known as the *File Allocation Table—FAT,* for short. DOS uses the FAT to keep track of which sectors on disk are currently being used for file storage. In a later column, we'll take a closer look at the FAT.

Track 0 sector 3 contains an exact duplicate of the FAT. If, for any reason, DOS is unable to read the first copy of the FAT, it will attempt to read the duplicate. This is a particularly interesting feature of DOS, one that contrasts sharply with similar operating systems that keep only one copy of the allocation table on disk. In such systems, if one single bit is incorrectly set for whatever reason—magnetic interference or dust damage, for instance—the entire disk may be rendered unusable and may have to be reformatted. Valuable information could be lost forever. Murphy seems to set the rules for this kind of problem: the more valuable the data, the easier it is to lose. It's heartening to know that DOS is sensitive to this problem.

Track 0 sectors 4 to 7 contain the actual disk directory. The directory has space sufficient for sixty-four entries. Each entry manages the storage information for one file and is thirty-two bytes long. Consequently, the entire directory is 64 x 32 bytes, or 2,048 bytes (2K) long. Every directory entry contains information about a particular file, including its filename and extension, the date that the file was created, and a pointer to the sector that contains the start of the file. It is from this directory that DOS derives the information it presents on screen when you invoke the *dir* command.

On a slave disk, the remaining sectors, track 0 sector 8 through track 39 sector 8, are available for user file storage. If you do a quick count, you'll see that leaves a total of 313 free sectors on a newly formatted slave disk. Since each sector can store 512 bytes, such a disk has a total of 160,256 bytes available for data storage. The other 3,584 bytes are unavailable and can be considered overhead.

On a master disk, on the other hand, other space must be allocated for storage of the operating system itself. As we mentioned earlier, this data is stored in two system files. These files are always in the same disk locations, so the boot code knows exactly where to find them. For this reason, master disks cannot be made from data disks as an afterthought. If you tried, any data in the locations reserved for the DOS system files would probably be erased or overwritten.

Track 0 sector 8 through track 1 sector 3 contains the system file *ibmbio.com,* and track 1 sector 4 through track 2 sector 8 contains the file *ibmdos.com.* Therefore, for master disks there is another disk space overhead of 8,704 bytes. More disk space is allocated to the file *command.com.* Because this file can be replaced by a user-developed program, it isn't actually considered overhead, although the IBM-supplied command.com does use an additional 4,447 bytes. In all, a master disk with the IBM-supplied command.com will have approximately 155,809 bytes free for user data storage.

The process by which master disks are created is slightly different from the normal formatting procedure. To format a disk for use as a data (slave) disk, all you need to do is issue the *format* command. DOS will then prompt for the disk drive containing the blank disk you wish to format. Enter the drive specification and the ever-required colon, and the format program will go to work. Once you're better acquainted with the process, you can speed things up a bit by specifying the target drive along with the format command. For example, if the DOS master disk is in drive A and you are logged onto it, and the blank disk is in drive B, then you can shorten the process by entering the command and the argument—in this case, the target drive specification—on one line by typing

A>FORMAT B:

DOS will then load the format program from the master disk and prompt you to enter a blank disk in drive B. Pressing the enter key then starts the formatting. When it's done, DOS will ask if there are other disks you wish to format. It's a good time-saver to format several disks at one time. Once all the disks are formatted, press the N key when asked if there are other disks to be formatted and DOS will return to the command processor, awaiting another command.

To create a master disk, DOS has the facility to set a switch in the command. This switch takes the form of a */S,* for *system.* The command to create a master or system disk in drive B would therefore be

A>FORMAT B:/S

The difference between the two processes is that DOS would transfer the operating system to the disk in drive B after it has written the formatting marks and directory information. A disk created

in this manner could be used to boot the operating system when you turn the machine on.

When you've finished formatting a disk, it's a good practice to issue the *dir* command immediately to make sure that the formatting has been done correctly. If the message NO FILES appears, then you know the disk is okay. Sometimes, however, DOS will not be able to format a portion of the disk correctly. In such cases, DOS will make a notation in the FAT that the offending tracks are unusable. This means that these tracks will not be available for data storage, assuring you of better data integrity. The unusable tracks will be allocated to a hypothetical file named badtrack in the directory, so they cannot be accidentally allocated to one of your data files. If DOS has marked any tracks as unusable, you'll be able to tell by issuing the *dir* command as soon as you've finished formatting the disk.

As a last word about the format command, be aware that it can be the most destructive of all the DOS commands. It should be clear that disks containing valuable information can quite easily be accidentally wiped clean by the formatting process. To guard against this outcome, be sure all your disks are correctly labeled and use write-protect tabs on disks that contain vital information. These tabs, which are placed over the cutout on the left side of the disk, prevent DOS from accidentally writing to the disk if you should happen to issue the wrong command.

Diskcopy. The next DOS command we'll examine is the *diskcopy* command, whose function is to make copies of a particular disk. *Diskcopy* acts as a bulk copier for making backup copies of disks. The copies, or target disks, are exact images of the original source disks. Target disks must first be formatted before you can copy to them with *diskcopy.*

In addition to *diskcopy,* DOS also has a *copy* command that can be used for transferring specific files from one disk to another. *Copy* can also be used to create backups of important disks, but since it works with one file at a time, it is considerably slower than *diskcopy. Copy* will be examined closely in a subsequent column.

The *diskcopy* command raises an important point about DOS syntax. DOS takes an approach to syntax that's different from the one that many people learned with the CP/M operating system from Digital Research. To illustrate, the syntax used by DOS to copy a source disk in one drive to a target disk in another is:

DISKCOPY D: d:

where *D:* is the source disk drive specification and *d:* is the target disk drive specification.

This is actually an intuitive, logical method of specifying the source and target. For example, if you wanted to copy the disk in drive A to the disk in the drive B, you'd issue the command

DISKCOPY A: B:

which can easily be remembered as "copy A: to B:." CP/M worked in a fashion opposite to this and was consequently somewhat counterintuitive and difficult to learn. If you've become familiar with CP/M you'll need to unlearn this approach.

Conveniently for those who have single-drive systems, *diskcopy* can be used as either a single-drive or a dual-drive copy program. When only one disk drive is attached to the system, *diskcopy* will read as much information into memory as it can hold and then prompt you to exchange disks so that it can write to the target disk.

Since *diskcopy* copies whole tracks at a time, it will also copy DOS itself. Therefore, if you need to make a backup copy of a DOS master disk, you don't need to format the target disk as a master; in other words, you don't need to use the /S switch in the *format* command.

With the *format* and *diskcopy* commands, you should be able to make backup copies of any important disks. In their documentation, IBM advises that, wherever possible, backup copies of disks should be used and originals should be kept on the shelf. This approach should ensure that valuable disks will never be lost.

Anyone who has used a personal computer in the past is well aware of the pitfalls that await the inexperienced operator. The accidental erasure of valuable software or data is perhaps the most frustrating of these. In any office where people are using a pc on a daily basis, the latter part of the day should be spent backing up the day's work. As time-consuming as that policy may appear, it is not, by a long chalk, as time-consuming or costly as reconstructing lost data.

Enough of preaching. Next month, we'll take a closer look at the other internal and external DOS commands, how they work, and what happens inside the system when they're used. ▲

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BOARDS & BUSES

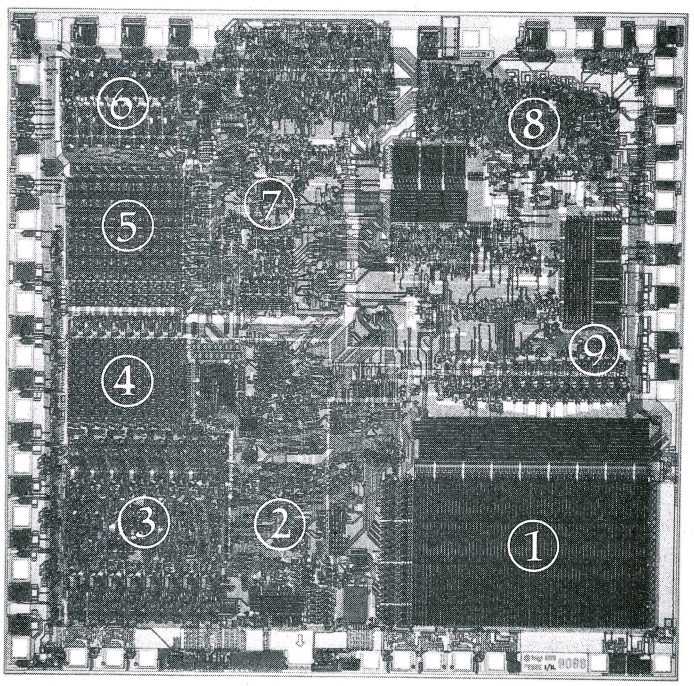
by Richard Kaapke

At work inside every IBM Personal Computer is an Intel 8088 microprocessor. This "third-generation" microprocessor performs the myriad of magical feats that make the pc work so well. Why did IBM choose this relatively untried device over a better known one like the Zilog Z80? Simply put, they chose it because the 8088 outperforms the Z80 in all applications for which the pc was intended.

This month we'll take a look at some of the 8088's features.

Like Intel's similar 8086, the 8088 is described as a third-generation microprocessor because its internal registers are sixteen bits wide. That means that it can operate on two bytes of data at one time. The Z80, 8080, 6800, 6809, 6502, and other so-called second-generation microprocessors are all eight-bit devices.

Besides being able to operate on sixteen bits of data at once, the 8088 has twenty addressing lines available to it. This means that when it wants to fetch data from, or send data to, some memory location, it has twenty bits with which to specify the desired memory address. The nature of the binary numbering system is such that twenty bits of data can be arranged in two-to-the-twentieth-power different ways—so the 8088's twenty-bit address bus allows it to address 1,048,576 unique memory locations.



A microscopic view of the Intel 8088 chip: (1) micro code ROM, (2) execution unit state control, (3) main arithmetic logic unit and program status word, (4) execution unit registers, (5) bus interface unit registers, (6) bus interface unit adder, (7) bus interface unit timing, (8) bus interface logic, (9) micro code address register. (Photo courtesy Intel Corporation.)

More Than Enough. Having the capability of speaking to more than a megabyte of memory may seem like overkill. After all, you may never have anywhere near that much memory in your machine. But it does make the pc a more advanced and versatile data processing system than the older, eight-bit microcomputers.

Among other things, this vast memory addressing capacity means that more than one program can be loaded into RAM at one time. The 8088 has something called *segment registers* that allow it to switch from one program to another. With the help of these segment registers, it's possible to set up the 8088 in such a way that it appears to run two or more programs simultaneously.

This ability of the 8088 to do more than one thing at a time means routine, time-consuming tasks can be put on a back burner while you continue to work on other, more pressing jobs. For example, you can run a long computation and write a separate program at the same time instead of having to wait for the computation to finish.

Included within the 8088's instruction set—the set of code that constitutes its native language—are instructions that allow for multiprocessor designs. Although it's doubtful that this capability will be exercised in the IBM Personal Computer, the 8088 has special control modes that allow it to work in tandem with other 8088s or 8086s. These special instructions make it possible to connect several processors, each of which might serve some special purpose and each of which could conceivably be running more than one program at once.

This multiprocessor capacity can be useful in the event the computer is going to be used by many people at the same time. (This multiuser concept is often called *time sharing*, and it refers to a setup in which all the people using the computer have their own display screens and keyboards but share certain common facilities, like printers, disks, and so forth.)

Two for the Price of One. The 8088 is actually subdivided into two processors: an *execution unit* (EU) and a *bus interface unit* (BIU). The execution unit does all of the "thinking"; that is, it performs all computations (except for some that are reserved for the 8087 coprocessor—more about that in a moment). The BIU does the "busywork" that consumes a lot of precious processor time on the Z80 and other second-generation devices. The BIU reads and writes data to and from memory, always at least one step ahead of the EU. The EU and BIU run in parallel, cooperating with each other admirably.

Picture the EU as the mastermind and the BIU as its secretary, fetching and filling all data requests in and out of the office. The EU never directly fetches or files data, and the BIU never does anything other than simply pass information in and out of the EU's office.

As a means of evaluating the 8088, the Intel Corporation ran a series of benchmark tests, comparing its performance in Intel's own iAPX 88 computer against that of a Z80A, the most widely used of the eight-bit microprocessors. They published the results in their *iAPX 88 Book*.

Tests of the relative execution time of the two chips resulted in a ratio of 3.79 to 1—meaning that in a sample of ten test programs, the Z80A logged execution times that were on average 3.79 times as long as those recorded by the 8088. These tests were run with the clock speed of the Z80A set at four megahertz; many of the popular computers using the Z80A run the chip at slower clock speeds, so one can assume that the IBM Personal Computer (whose 8088 is set to run at 4.77 MHz) will perform on the order of three and one-half times as quickly as most Z80A-based machines.

In addition to this speed advantage, the *iAPX 88 Book* claimed that the 8088 was easier to program and more code efficient than the Z80A, outperforming its predecessor on those scales by factors of 2.51 and 1.97, respectively. "Easier to program" means that implementation of the benchmark programs required fewer machine-level instructions on the 8088 than on the Z80A. *Code efficiency* refers to the number of bytes required to store the benchmark programs in memory.

A Companion Better Than the World's Best Calculator. There's an empty socket next to the 8088's socket on the pc systems board; judging by its pin arrangement and by comments in the *IBM Technical Reference Manual,* this socket appears to be reserved for the Intel 8087, a coprocessor chip scheduled for quantity production in the second half of 1982. The 8087 is designed specifically to do floating-point mathematical calculations. If and when it takes its place beside the 8088, it will improve by factors of a hundred or more the speed at which the pc will handle numeric operations.

The 8088's registers can perform elementary operations upon two bytes of data at a time. While this capacity is adequate for doing addition and subtraction with even fairly large integers, it is not sufficient for single-step calculations involving fractional quantities. These nonintegral numbers are stored in the pc in a floating-point representational scheme that requires five bytes per number. Hence calculations involving nonintegral quantities, on the 8088, must be broken down into a good many substeps.

The 8087 will be able to operate on integers up to eighteen digits wide and floating-point numbers up to ten bytes wide. It will also have built-in instructions for doing things like square root and trigonometric calculations.

Much the way the BIU works with the EU, the 8087 will run in tandem with the 8088, automatically doing mathematical operations for the 8088 and passing data to its assigned positions. The two chips working together will result in an enormously more efficient number-crunching machine than the pc with an 8088 working solo.

Superior designs don't always result in superior products; in fact, a superior design is meaningless if you don't take advantage of it. Among the ways the IBM Personal Computer takes advantage of the 8088's architecture are: a type-ahead buffer that remembers the keystrokes you've typed before the program you're running is ready to read them; graphics character generation, scrolling, and editing; and input and output buffering of data to and from external devices. While these features can be implemented on eight-bit systems, they usually aren't because of programming or memory space considerations.

Because of its 8088 microprocessor, the pc allows programs written in Fortran-77, UCSD Pascal, or Cobol to be compiled and run that might be either inconvenient or impossible to run on a machine with a 64K address range. For the business computer user, programs to assist in all phases of management can be run together at one time, without requiring the user to stop one process and spend extra time starting the next one. For the computer user at home, a complete range of household management, entertainment, and educational programming can be made available.

This inclusion of the Intel 8088 in the IBM Personal Computer is a step that safeguards the computer from obsolescence in the foreseeable future. ▲

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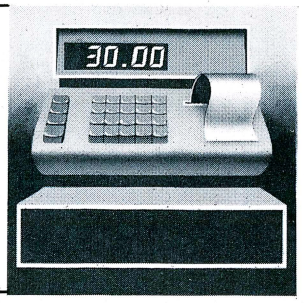

It's still no contest.

WordStar, the bestselling program in the history of CP/M, took its best shot at *VisiCalc* during the month of May and the result was a surprising landslide victory for the spreadsheet.

As back orders mounted, anticipation was high that *WordStar* would unseat the uncrowned champ of ten microcomputer markets. And the classy word processor didn't disappoint from a sales standpoint. *WordStar* in May easily outdistanced *VisiCalc*'s sales for the month of April.

But so did *VisiCalc*; and in the process of outstripping its own sales marks, it also outsold *WordStar* three to two. MicroPro's bellwether program nevertheless clearly established itself as the number two program in the Personal Computer marketplace with nearly double the sales of third-place *Adventure*.

Another veteran of the CP/M wars, *SuperCalc*, was the only other newcomer to the Top Thirty to jump into the first ten positions. The spreadsheet program that's been offered as the *VisiCalc* alternative was ninth in its first month on the list. The widespread use of electronic spreadsheet programs on personal computers is underscored by the presence of two such programs among the top ten.

Making the biggest jumps within the list during May were two programs that benefited from previous supply shortages. IBM's *Asynchronous Communications Support* package and IBM's *Macro Assembler* were both on a back-order status during April. As the products began hitting the market, they were snapped up by anxious users, boosting sales way above normal monthly demand.

The *Asynchronous Communications Support* software is starting to get some competition as *Crosstalk* enters the IBM marketplace.

Also new to the top ten were Continental's *Home Accountant Plus* in fourth and Omric's *Space Guardian* in tenth.

Dropping out of the top ten were the *Accounts Receivable* and *Accounts Payable* modules of Peachtree's accounting system, *IBM Pascal*, *Total Information Management* from Innovative Software, and *Temple of Apshai* from Automated Simulations. *TIM* was incorrectly identified in last month's Top Thirty listing as *The Information Manager*.

The word processing laurels clearly go to *WordStar*, but a real battle for second is shaping up. *EasyWriter* as sold by IBM is a clear second choice and was sixth overall in May. But *EasyWriter II*, to be sold directly by Information Unlimited Software, is getting raves from dealers. Dealers seem to be splitting low-end sales between *Volkswriter* and *Write-On*, with both making stronger showings in May.

Infocom scored a coup by placing three entries on the Top Thirty in its first month of business. *Zork I* ranked fourteenth, *Deadline* was tied for seventeenth, and *Zork II* stood at twentieth.

MicroPro doubled its first-time entries when *MailMerge*, the powerful mailing program that interacts with *WordStar*, tied with *Deadline* for seventeenth.

Even though *IBM Pascal* dropped out of the top ten, interest in languages other than Microsoft Basic continues strong. Pascal is the clear leader of that bunch with IBM's version running under PC-DOS twelfth and *UCSD Pascal*, which includes its own operating system, scoring twenty-first in its first month of release.

Other languages in fair demand were *Fortran*, which rose to nineteenth, and *Cobol*, which snared the bottom rung of the Top Thirty. Microsoft isn't exactly suffering because of the abandonment of their Basic, however; Fortran, Cobol, and Pascal operating under PC-DOS are all Microsoft products.

Additional programs making the list for the first time were *Star Trek* from Zeta Products and *Money Decisions* from Eagle Software Publishing.

The continuing recession is beginning to take its toll in the microcomputer marketplace. After months of continued growth, most Computerland stores were reporting flat or slightly lower sales of systems and software in May. The Personal Computer marketplace has stood up better than any other; and observers can only speculate on what IBM sales would be if the economy were more conducive.

Dropping off the Top Thirty were *Dow Jones Portfolio Evaluator*, *Everest Explorer*, *Arithmetic Games*, *Fact Track*, *Speed Reader*, *Cyma General Ledger*, *CompuCube*, and *Championship Blackjack*.

Computerland dealers, who are accustomed to handling hot-selling entertainment software for the Apple market, are reporting that the Personal Computer's split personality as regards video display is depressing the game market. Owners with monochrome monitors cannot successfully run such hi-res programs as *Temple of Apshai* without a graphics adaptor. The shortage of quality hi-res games has not caused a run on the adaptors, although it can be assumed that many will make the buy when there is enough compelling software to warrant the purchase.

In the meantime, text adventures are cleaning up because they have the versatility to play on any system configuration. *Microsoft Adventure* sits atop the game segment of the marketplace with *Zork I* fourth, *Deadline* sixth, and *Zork II* seventh.

The hazards of polling in a marketplace lacking a wide product base were amply illustrated by the results reported for *Championship Blackjack* in the June issue. The program was credited to PC Software as author and Cavalier Computing as publisher. It tied for the last position on the Top Thirty.

The results were reported only from southern California stores and reflected some test marketing apparently done by each of the principals. Cavalier expressed bemusement when told of the results, explaining that the program was "only 95 percent done, and we haven't been able to get in touch with the authors to have them finish it."

Subsequently, a representative of PC Software questioned the results. He likewise claimed the program was not on the market, although "we've showed it to local Computerlands and they're taking orders." He dismissed any claim Cavalier might have to the product, saying that "we talked to them about it, but withdrew the

program when they missed a couple of milestones we had established."

This all came as a great surprise to Cavalier and, at last hearing, the parties were attempting to straighten out the mess. In any event, *Championship Blackjack* is still not being delivered.

The lack of widespread distribution of independent products and the thin selection of titles available makes calculating the probability of statistical error hazardous. The methodology used strikes an average that does little justice to parts of the list. The probability of error is lower as it relates to the top of the list and much higher as it relates to the bottom few programs. The probability reported strikes a mean between the extremes.

For all of these disclaimers about lack of depth, the market is coming along quite nicely. Fully 25 percent more titles were reported in May than April and a like explosion can be expected in June.

As MicroPro, Sorcim, and Infocom showed, good software can make an immediate impact in the marketplace. VisiCorp isn't doing so bad, either. ▲

IBM Personal Computer sales outlets representing approximately 12.7 percent of all sales of pc and pc-related products volunteered to participate in the poll.

Respondents were contacted early in June to ascertain their sales for the month of May.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in June represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only for the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

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the top thirty

This Month	Last Month	Index	
1.	1.	155.61	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston; VisiCorp, IBM
2.	—	99.26	**WordStar;** MicroPro
3.	4.	52.74	**Microsoft Adventure,** Gordon Letwin (Will Crowther and Don Woods); IBM (Microsoft)
4.	12.	39.64	**Home Accountant Plus,** Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Continental Software
5.	22.	33.74	**Asynchronous Communications Support;** IBM
6.	2.	30.79	**EasyWriter,** John Draper; IBM (Information Unlimited Software)
7.	27.	26.82	**Macro Assembler,** Microsoft; IBM
8.	6.	25.88	**General Ledger;** IBM (Peachtree Software)
9.	—	24.57	**SuperCalc;** Sorcim
10.	13.	20.97	**Space Guardian;** Omric
11.	13.	20.64	**Las Vegas Blackjack,** Charles Montante; Quala
12.	8.	16.38	**IBM Pascal,** Microsoft; IBM
13.	5.	15.72	**Total Information Management;** Innovative Software
14.	—	15.40	**Zork I,** David Lebling and Marc Blank; Infocom
15.	17.	14.41	**Typing Tutor,** Michael Sierchio (Dick Ainsworth and Al Baker); IBM (Microsoft)
16.	3.	13.76	**Temple of Apshai,** Jeff Johnson, John Freeman, and J.W. Connelley; Automated Simulations
17.	—	12.78	**Deadline,** David Lebling and Marc Blank; Infocom
	—	12.78	**MailMerge;** MicroPro
19.	24.	12.12	**Fortran Compiler,** Microsoft; IBM
20.	—	11.14	**Zork II,** David Lebling and Marc Blank; Infocom
21.	—	9.83	**UCSD Pascal,** Kenneth Bowles; IBM (SofTech Microsystems)
22.	11.	7.53	**Time Manager,** Dick Ainsworth, Al Baker, and Jeffrey P. Garbers; IBM (Microsoft)
23.	24.	7.21	**VideoGraph 88;** Windmill Software
	—	7.21	**Star Trek;** Zeta Products
25.	—	6.55	**Money Decisions;** Eagle Software Publishing
	13.	6.55	**General Accounting,** John Moss and Ken Debower; BPI
27.	7.	5.90	**Accounts Receivable;** IBM (Peachtree Software)
28.	9.	5.24	**Inventory;** IBM (Peachtree Software)
29.	9.	4.91	**Accounts Payable;** IBM (Peachtree Software)
30.	—	4.26	**IBM Cobol,** Microsoft; IBM

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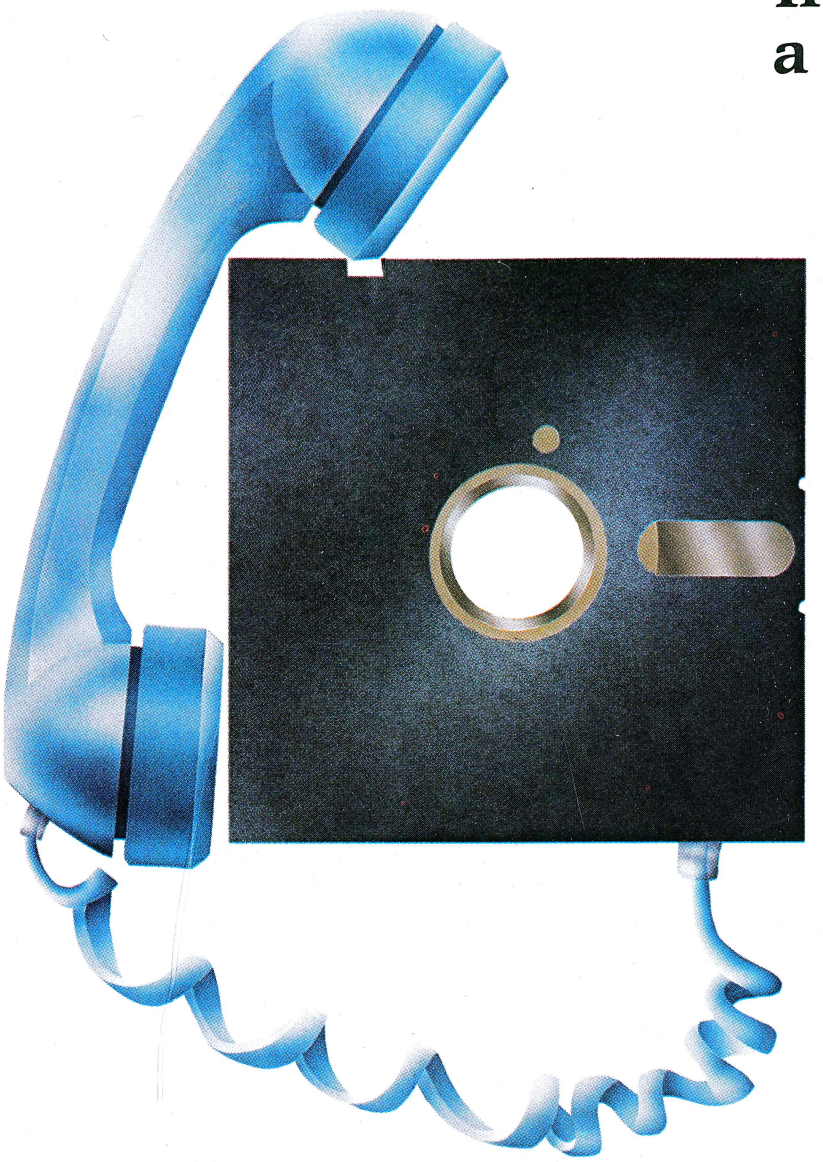

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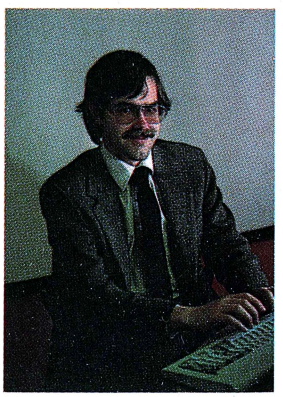

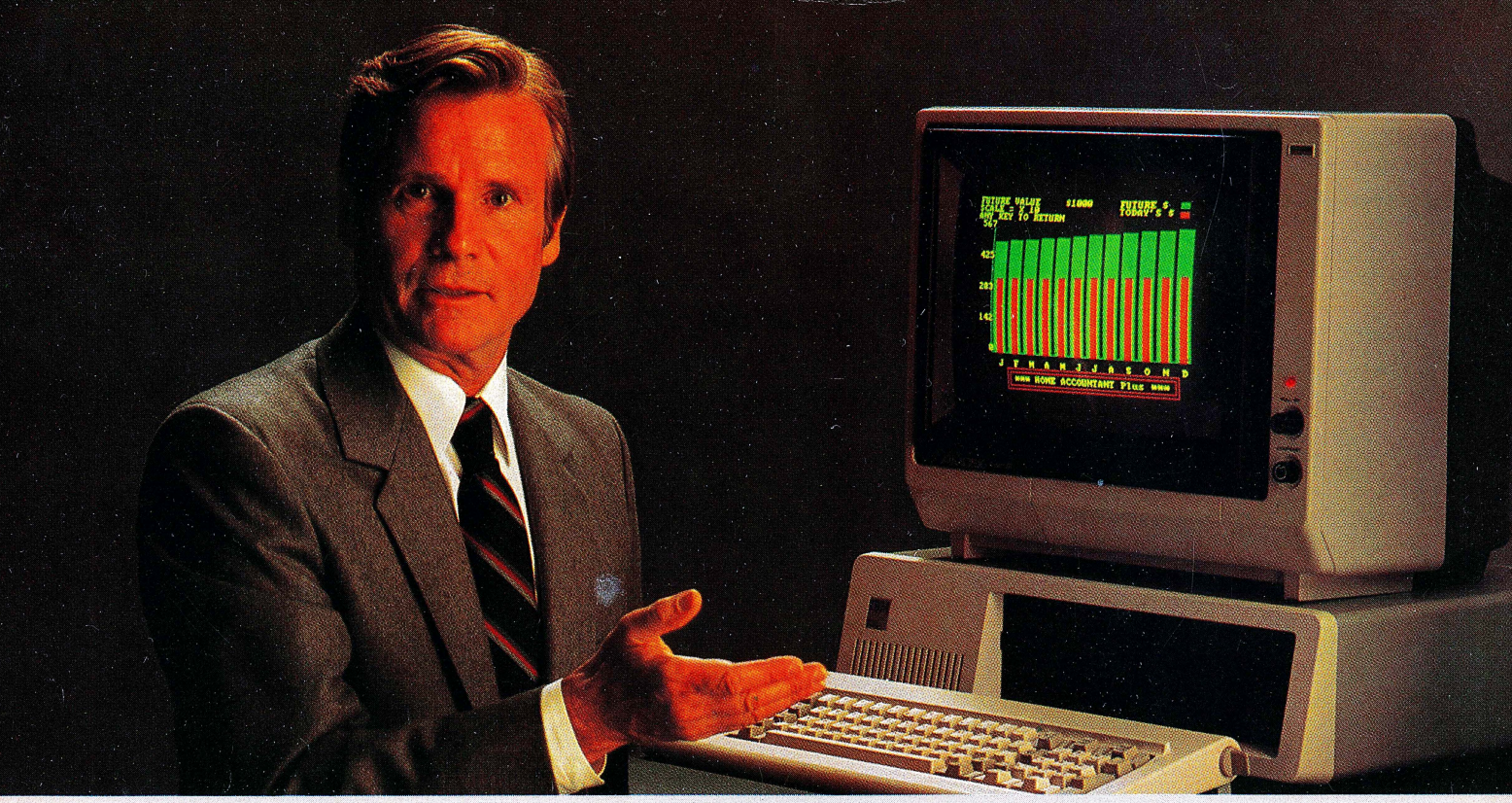

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